THE NEW
ADVANCED CUSTOM ROD BUILDING

Dale P. Clemens

ISBN 0-8329-0436-8 $27.95

ADVANCED CUSTOM ROD BUILDING

Dale P. Clemens

The importance of a fishing rod to the serious angler can hardly be overestimated. It is the extension of his hand, the primary instrument by which he lures, hooks, plays, and lands a fish. It follows, then, that the rod that is handcrafted for the angler, for his preferences and idiosyncrasies, for his kind of fishing, is simply going to be more responsive, more enjoyable than a production-model rod, no matter how well made.

Few anglers, however, are fortunate enough to have a rod handcrafted for them, and it is for the rest of us that Dale Clemens has completely rewritten this new book. He continues to display his expertise in his discussion of methods for building every kind of rod—from ultralight-fly to surf and offshore trolling. Following detailed explanations and illustrations, rod builders can design, build, and embellish rods to suit their particular desires and needs.

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ADVANCED
CUSTOM
ROD BUILDING

ADVANCED CUSTOM ROD BUILDING

Revised, Expanded Edition

Dale P. Clemens

Winchester Press
An Imprint of *NEW WIN PUBLISHING, INC.*

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Printing code
22 23 24 25 26

Library of Congress Cataloging-in-Publication Data

Clemens, Dale P.
Advanced custom rod building.

Includes index.
1. Fishing rods—Design and construction. I. Title.
SH452.C52 1987 688.7'91 87-15995
ISBN 0-8329-0436-8

Dedication

To my wife, Donna—who originally said there would be no "son of fishing rod," but who subsequently encouraged, helped, and did everything in her power to provide me with the necessary time.

Acknowledgments

Very few books are written by one person alone, and this one is certainly no exception. I am deeply indebted to those RodCrafter Associates who unselfishly shared their ideas and methods so that others might learn. Rather than list their names here, I feel it will be more meaningful to mention each of them in the text along with the particular technique discussed. Beyond those individuals cited by name, I want to thank all RodCrafter Associates who shared their thoughts in our journal and participated in our seminars. Their efforts have done much to advance the craft of custom rod building, and will continue to do so in the future.

The only way I was able to find the time for this project was through the extra efforts of the manager of my rod-building supply business, Dick French. Dick is a close personal friend, and he was always available, whether to consult on a rod-making problem or to carry even more of my share of the load. Some special photos and drawings were the work of Jack Justis and Joy Dunlap, two of the finest rod builders I know. A great deal of photographic and darkroom assistance was rendered by Ron Dunn, both for the original edition and this revised edition.

There is a very special person in my life with whom I share everything. This book was and is dedicated to her. Here, however, I want to thank Donna for typing the manuscript from my almost illegible handwriting.

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Introduction

More than any other piece of fishing tackle, the rod is constantly in hand. It is, in fact, the extension of the angler's hand and the primary instrument through which he transmits his fishing skill. With it he casts to the precise spot chosen, manipulates the lure to entice his quarry, retrieves through the selected water, and finally plays and fights his fish. It is irrefutable logic that the better the rod is matched to the angler, the water, and the specific fishing at hand, the greater will be the expression of the angler's skill, the more he will enjoy his fishing, and the greater will be his chances of success.

Away from the water, fishing rods are frequently a great point of discussion among anglers. Brought out for examination, admiration, and criticism, they are the subjects for debate and the reminders of fishing exploits past and anticipated. In short, rods are accorded the attention and respect they deserve. The reader of this book does not need to have explained that the well-designed and well-made custom rod is always superior to a factory-made rod. The enjoyment of fishing—which, when all is said and done, is really more important than the actual catching of fish—is enhanced tremendously for the angler using a custom rod.

This all became apparent to me years ago when I built my first rod. I didn't invent that experience—many before me had discovered the same thing. And certainly many more have discovered it since, for today increasing numbers of people are discovering the joys and rewards of this fascinating craft. There is much evidence to suggest that custom rod building is presently the fastest-growing segment of the entire tackle industry. To me this is exhilarating, and I only hope that more of the millions of fishermen will try building their own.

For some years before I wrote *Fiberglass Rod Making*, I found myself increasingly on a course of trying to convince fishermen that they could build a better rod than they could buy. The initial suggestion that I write a book for the beginner took me by surprise, but in all honesty I must admit that once started it was a labor of love. Here was an opportunity to encourage many more people to build their own rods. As I took the plunge with the book, I went all the way and expanded my rod-building-supply business to a national mail-order venture.

The response went far beyond what I could have hoped for. Within three years the book was in its fifth printing and scheduled for a softcover edition. My mail-order business grew to become one of the largest. What was perhaps most exciting was the incredible number of letters I received from rod builders both new and experienced. It soon became apparent that (1) I could not personally handle the volume of correspondence, nor was I necessarily qualified to do so, and (2) there was an obvious need for a forum where ideas, methods, and techniques could be exchanged on the subject. Thus was

RodCrafters born—an international organization for custom rod builders, both hobbyists and professionals. It has grown by leaps and bounds. Its purpose is "to encourage and improve the development of rod making as a craft through the exchange of ideas and techniques." The key to the whole concept is sharing.

This unselfish and exciting give-and-take occurs in the bimonthly *RodCrafters Journal*. Since the first issue in January 1975, I have had the pleasure of publishing the *Journal* and the rewards of learning from the many outstanding articles. All of the material is submitted by our Associates (that's what we chose to call ourselves), and my staff and I merely edit and rewrite as necessary. The *Journal* is printed on heavy book paper for retention as a permanent reference library. Each year we have held seminars with custom builders from all across the country attending.

Many of the ideas presented in this book were first shared in the *RodCrafters Journal*. In each case I have tried to credit the individual Associate. None of us is naive enough to think that he necessarily invented the technique or was the first rod builder ever to use it. However, the willingness to share publicly certainly deserves recognition, for from it we all learn and advance the development of our craft.

Personally, I believe that anyone who enjoys building custom rods and who wants to learn more about the subject should become associated with RodCrafters. Through this forum he can probably learn more about some aspects than he could in a lifetime of experimenting on his own. Then too, as our numbers grow, so will the exchange of meaningful and helpful ideas. If you would like more information write:

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444 Schantz Spring Road
Allentown, PA 18104

As the title states, this book is on "advanced" rod making. Advanced, however, only in the sense that it attempts to take over where *Fiberglass Rod Making* left off. In no way is it meant to be construed as the final word on the subject. No one will ever write such a book. Even as this is written, our RodCrafter files are full of new ideas awaiting editing and publishing in future issues of the *Journal*. New techniques, materials, and ideas are constantly being developed. It has been my observation that few people are as creative and innovative as are custom rod builders. They will continue to evolve new methods and place increasing demands upon manufacturers for ever better quality components.

Manufacturers are keenly interested in the tremendous growth that has occurred in custom rod making, since in it they see an entirely new market. This has carried mixed blessings for the rod builder. By and large, custom builders have always wanted the highest-quality components—better, if possible, than those used on the best of factory rods. The buying power of their increased numbers has brought forth excellent quality, often in specialized products made largely or only for the custom builder. So, on one hand, we've never had it so good. Unfortunately, this large market has also attacted the attention of manufacturers and vendors whose business is low-end products. In the last decade they have plagued the tackle industry with their mediocre and low-quality items, especially rods. It has only been the last couple of years, however, that they have been aggressively marketing the same components used on the cheap factory rods to the custom market. To the uninitiated, they look almost the same, and cost less. In the end, the rods built with these products will not perform well or long, and rod builders will be discouraged.

There is so much to be gained from making good rods from good components, that the loss of people from the craft would be tragic. Now, more than ever the custom builder needs to recognize and stick with top quality.

Despite this one note of caution, I feel the future of custom rod building looks brighter than ever. It is my hope, then, that in this book you will find ideas that will enable you to build even better rods and more fully enjoy the many rewards.

Dale P. Clemens
Allentown, Pennsylvania

ADVANCED
CUSTOM
ROD BUILDING

ONE

The Blank

Any discussion of custom rod building has to start with the blank and its proper selection for the rod to be built. Today we are blessed, although at times confused, with a huge assortment of all kinds of blanks from an increasing number of manufacturers. With the tremendous upsurge in custom rod making, the market for blanks has become so large that sizable sums can be spent in advertising and sales promotion. This is a definite advantage in keeping the crafter of rods informed, but a basic knowledge of the construction of the blank is helpful and in some cases necessary for proper selection.

FIBERGLASS

Uncounted millions of fishing rods have been made of fiberglass, and no doubt many more will follow. The basic technology for making hollow fiberglass blanks, although initially crude by comparison, is nevertheless the father of graphite technology. There are two methods in use: the conventional process and the much less used Howald process.

Conventional process

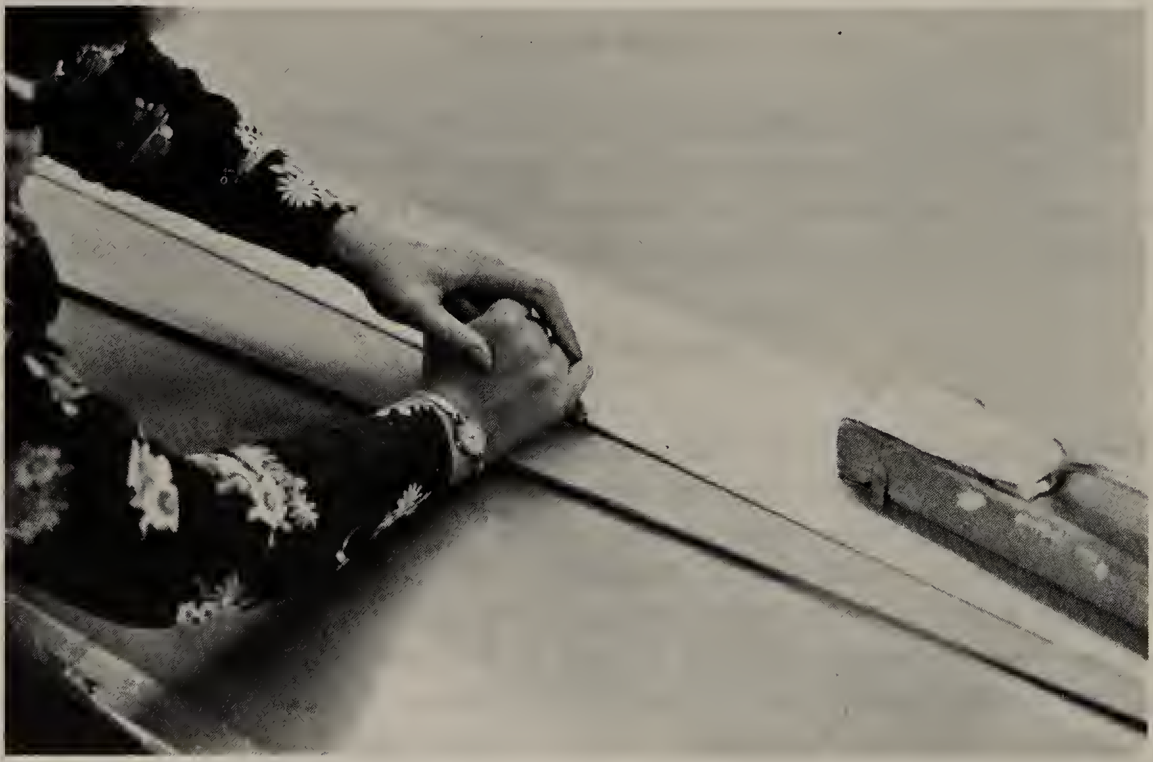
By far the largest number of blanks are made by what is commonly referred to as the conventional process. While there are variations among manufacturers, the system employed consists of the same essential steps. To start with, special chrome-treated, resin-impregnated fiberglass cloth is used. On quality blanks, the weave of this special cloth is made so that there are more fibers running in one direction than the other. This allows most of the fibers to be aligned along the axis of the blank, with just enough cross fibers circling the blank to provide the required hoop strength. Basically, there are two fabrics used, light and heavy. The light fabric used has about 75% to 80% of the fibers placed longitudinally and weighs 5.42 ounces per square yard. The heavier cloth has about 85% to 90% of the fibers in one direction and weighs 8.65 ounces per square yard.

Various thermosetting resins are used to impregnate the glass cloth and to bind the fibers together. One of the earliest was a nylon-plasticized phenolic resin. It does an excellent job, but is more difficult for the manufacturer to handle and has a shorter shelf life after impregnation, but before curing, than the newer resin systems. Also, it has the disadvantage of darkening in color with age. It should be explained here that the term "shelf life" refers to the storage of pre-impregnated fiberglass cloth by the manufacturer before the blanks are made. The large blank companies order their cloth pre-impregnated from the makers of glass. They specify the weave desired, the resin to be used, and the amount of resin in the mixture. Purchases are made in large quantities and then stored for use in production over a period of time. The length of time that the resin-impregnated cloth can be stored, or its shelf life, is thus important to the manufacturer.

Epoxy resins were developed with a slightly longer shelf life and more ease in handling. Certain attributes of epoxy allow a lower amount of resin in the finished blank if handled under very carefully controlled manufacturing processes. While generally too costly for fiberglass, these extra controls are compatible with the graphite process. Epoxy resin is therefore used more with graphite than with fiberglass.

The predominant resin system used in today's glass rods is polyester. Its development allowed higher-density laminations containing less total resin. It also has the longest shelf life after impregnation and is the easiest with which to work —both important considerations to the manufacturer and to the final cost of the rod blank.

In the conventional process of making hollow fiberglass blanks, a pattern is cut from the impregnated cloth. Heat is used to tack one side of the pattern to a tapered steel mandrel, and it is rolled under pressure around the mandrel. In order to create a high-density lamination, it is important that the wrapping pressure be high and uniform all along the length of the mandrel. There are different techniques for performing this operation, and some of them are very much trade secrets. Precision equipment is required and usually consists of heated platens that can be adjusted for the contours of different blanks. As the cloth is wrapped around the mandrel, the high pressure forces air out, resulting in a porosity-free blank of high density and thin walls. In fiberglass, this type of

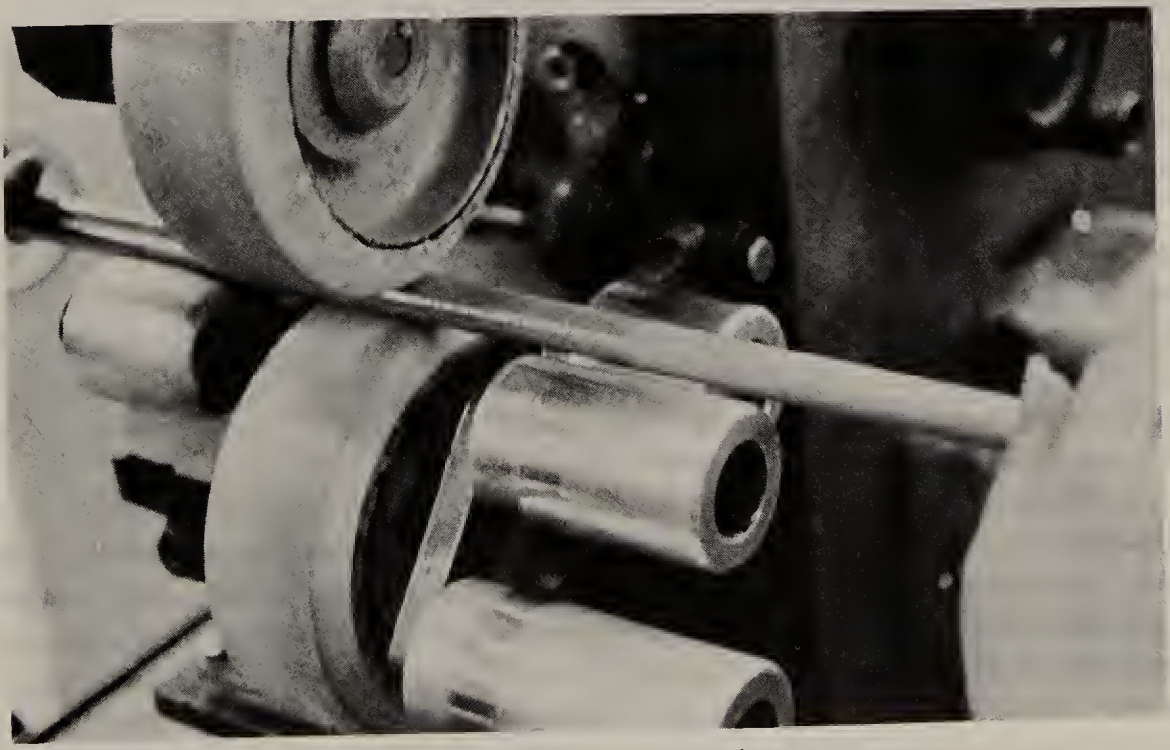


Pattern is cut from fiberglass cloth.

Pattern is tacked to mandrel before wrapping.

blank is preferable to one of thicker-walled construction for its greater strength and responsiveness. As one would expect, it will be more expensive than the less-desirable and easier-to-make thick-walled blank. It should be noted that the amount of fiberglass contained in a thin and thick-walled blank is often the same. The thin-wall blank has been "squeezed" for a higher density and greater strength.

After the cloth is tightly wrapped around the mandrel, the outside of the mold for the blank must be added. This consists of spirally wrapped cellophane tape of ½ to 1 inch in width. The term "cellophane" is generally used, although some companies use different polyester or FEP fluoroplastic films. As when wrapping the cloth, high uniform pressure is the objective for top quality, and precision equipment is required for the best results.



Fiberglass cloth and mandrel are wrapped with cellophane.

Wrapped mandrels are placed in huge oven for curing.

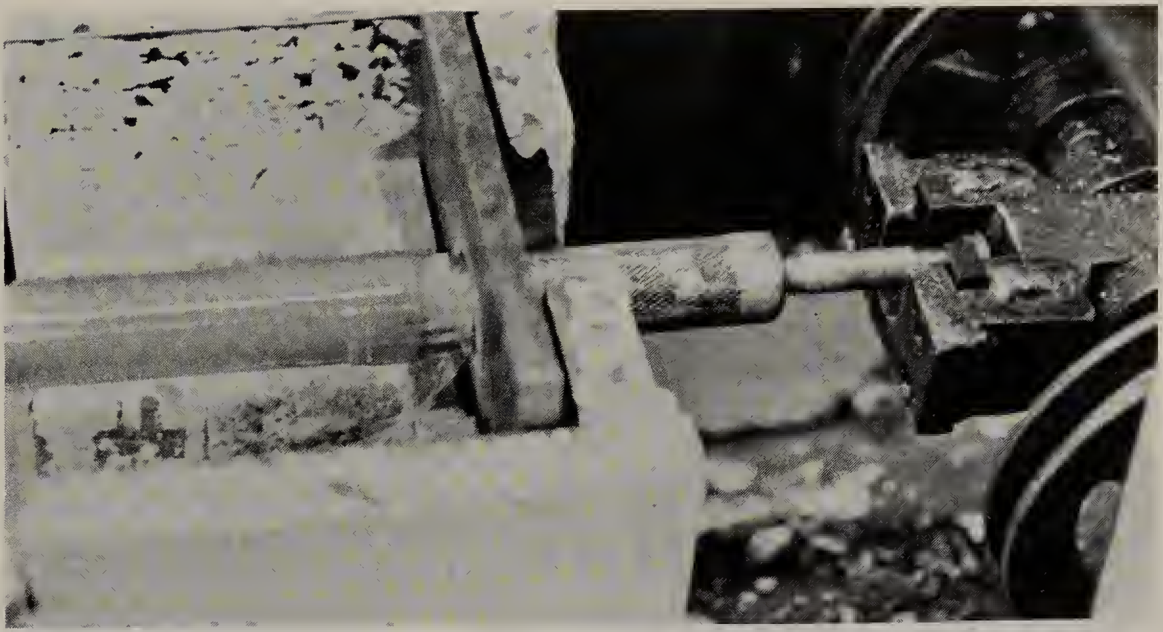
This cellophane film applies pressure to the laminate not only when it is wrapped, but during the curing process. This happens when the blank is baked and the cellophane shrinks. At that point the resin temporarily liquefies, and the tape provides a smooth surface inside of which the resin is free to flow for even distribution.

The blanks are hung vertically in an oven for 30 to 60 minutes at a temperature of 300° to 350°F. The variables depend upon the resin system used and are precisely controlled. The resin first turns into a low-viscosity liquid, at which time it is free-flowing. It next becomes a gelatin, and then finally hardens to the desired degree for a full cure.

After the blank has cured, the mandrel, which is longer than the blank and has a notch in its base, is removed from the tapered blank by a rap from a power ram. It is cleaned for reuse and carefully handled to preserve its true shape. The cellophane film must now be removed from the outside of the blank. Various techniques can be used. One of the most common is a short "soak" followed by running the blank against a revolving large-diameter soft-wire-mesh brush. Other methods include high-pressure steam, splitting or stripping the film, or a tumbling process.

With the cellophane removed, the blank contains the slight indentations or spiral marks left by the film. These ridges of extra resin can be removed by carefully controlled sanding to produce a smooth, finished appearance. Precision equipment that automatically adjusts the speed of the sander to the changing diameter of the blank is required, and its operator must be highly skilled.

Since there have been advertising claims for the added strength of unsanded blanks, this aspect of construction warrants further explanation. If two identical blanks had the

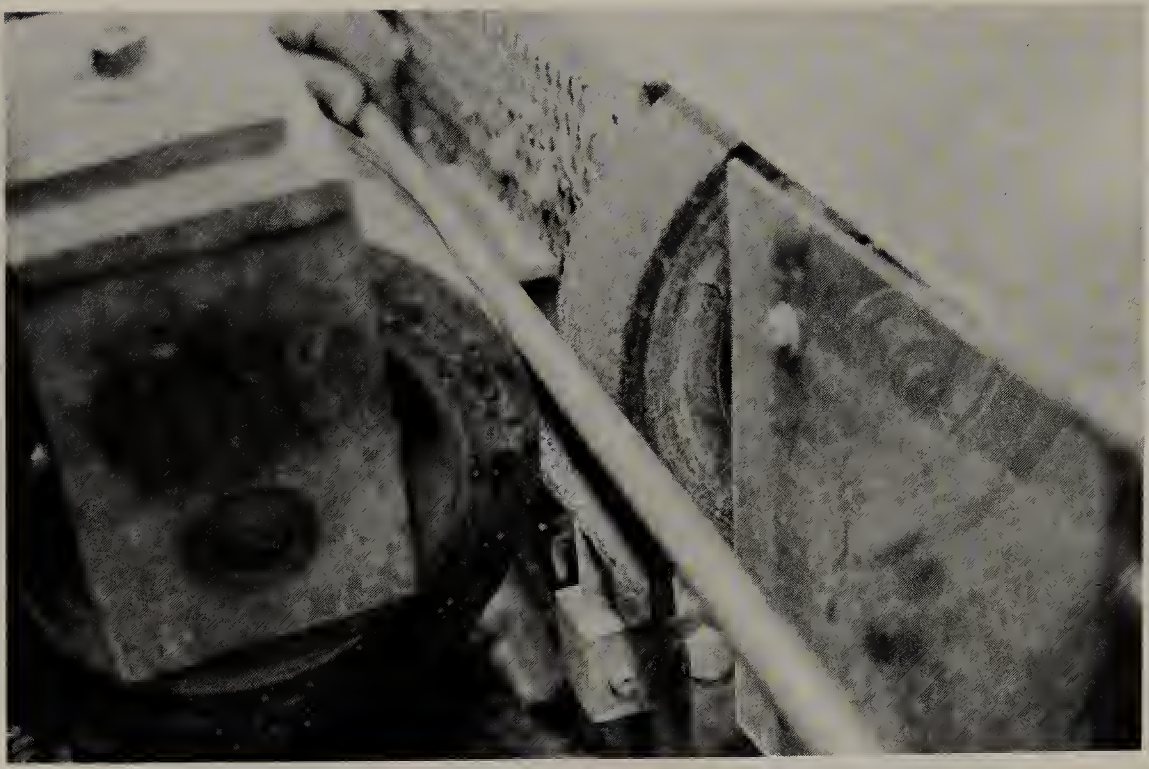


Holed plate retains blank while notched bottom of mandrel fits in hydraulic ram for removal of mandrel.

Mandrels are meticulously cleaned for reuse.

cellophane removed and one was sanded and the other unsanded, we would find these differences. The unsanded blank would be about 5% to 10% heavier, but would also be up to 20% stronger. The reason for this is that no matter how fine the sanding equipment and how talented the operator, some of the exterior glass fibers will be removed or fractured. If we simply left it at that, it would be true that the unsanded blank is indeed stronger.

Rod designers are well aware of this fact and can plan on offsetting the loss from



Wire mesh wheels strip cellophane from cured blank.

sanding by calculating the additional amount of glass to be added to the original pattern. When this is done by a top-quality manufacturer, any difference in strength or weight becomes rather insignificant. Sanding can also be a form of quality control by revealing any "blisters" or bubbles in the wall resulting from incomplete lamination. It must be remembered, too, that in many types of rods pure strength is not the most important criterion for judging the performance of the blank.

Other factors being equal, the unsanded blank is less expensive to make simply because an entire step utilizing costly equipment can be eliminated. By many, it is also judged less pleasing in appearance.

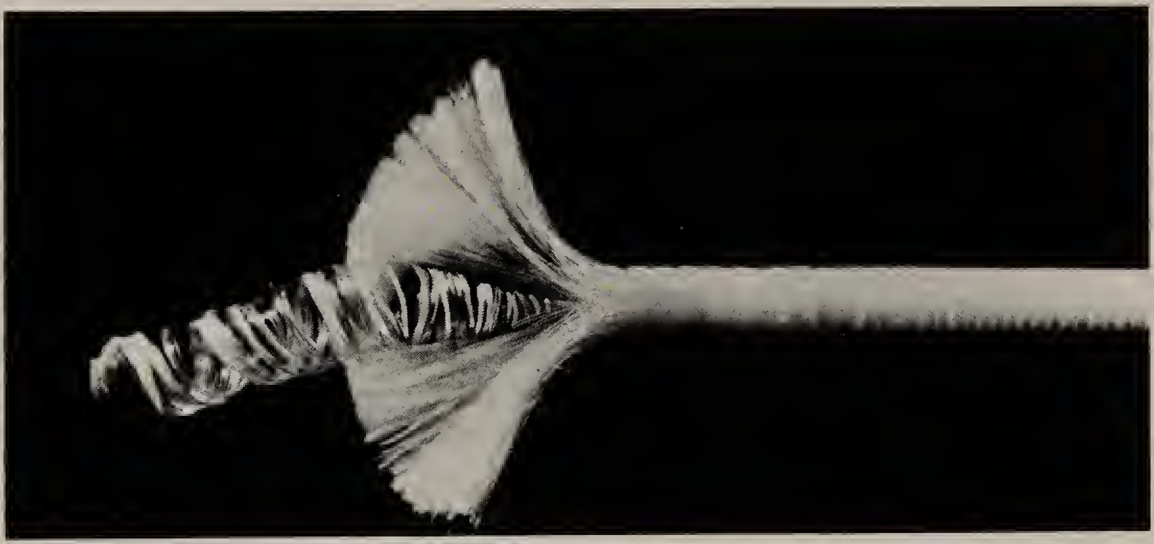
Color is given a blank by one of two methods. In those of the highest quality, the pigment is added to the resin. The color is constant throughout the blank; any imperfections occurring during the manufacturing process are easily seen, and the blank is rejected. On less expensive blanks, the color consists of a layer or two of paint squeezed on the surface. Imperfections and blemishes are easily hidden, permitting fewer blanks to be classed as rejects. In use, rods made from such blanks are more apt to show signs of wear from scratches, abrasion and nicks.

Within the industry the approach used to design a given fiberglass blank has often been referred to as the "cut and hack" method. Such a term seems unduly harsh and implies a crude approach to design, which it really is not. A better description would be "trial and error based on experience."

Once the action and performance characteristics of the desired blank are defined, the designer selects a mandrel. He knows that the amount of fiberglass at any point will determine the action and power of the blank. He then proceeds to cut what he feels will be the correct pattern from impregnated cloth, and the blank is made. A rod is built on the blank and testing begins. Careful notes are made of performance. If the blank is too stiff in total or in certain sections, a new pattern is tried with less material. The new blank is then tested. If the desired action is obtained but the blank is too weak, work starts over again with a new mandrel. In the process it may be necessary to have an entirely new mandrel made rather than use one of the company's existing stock mandrels. Obviously, the experience of the designer plays a great part in projecting results and eliminates what could otherwise be hundreds of steps in repeated trial and error. The designer occupies a position of importance to the manufacturer, and each develops certain approaches and individual philosophies to the design of a given company's blanks. This is why even though a manufacturer may produce a great number of different blanks for many different fishing situations, their action and tapers will frequently be similar or of the same general class.

Howald process

The Howald process is an older, patented machine process utilizing separate resins and fiberglass yarn. The yarn is saturated with resin and first spirally wound around the removable mandrel. This forms the core of the blank and provides the necessary hoop strength. Over this core is automatically placed yarn, also saturated with resin, but aligned with the axis of the blank. This is followed by a spiral wrap of cellophane tape to seal the outside and hold the fibers in place while the blank is cured. The cellophane is, of course, subsequently removed. As I understand it, small-diameter hollow tip sections are incompatible with this process, and they are made of solid fiberglass.



Howald process of blank construction.

Blanks made by this process have excellent durability and adequate performance for most fishing situations. Definitely lighter than solid fiberglass, they are nevertheless heavier than hollow glass blanks made under the conventional method. Economies of production are possible, since it is a machine process and separate yarn and resin are used rather than the more expensive resin-impregnated fiberglass cloth.

GRAPHITE

In 1974, Fenwick introduced the first rods constructed of an entirely new material, graphite. Within a relatively short time, other companies were producing rods of this space-age material. Not since the introduction of fiberglass, over twenty-five years before, was the attention of fishermen focused so sharply on rods and rod building. So acute was their awareness, and so large was the potential market that new companies were formed to jump on the graphite bandwagon. Interestingly, most of those newly formed companies are no longer in existence a decade later. As it turned out, a *good* graphite rod blank was a lot harder to make than most everyone imagined. Those manufacturers that were successful built upon their years of experience and technology in making quality fiberglass.

While a graphite rod will not cure all angling ills, a good one does possess some remarkable attributes that improve performance and make it the best fishing instrument yet devised. Chief among them, and least understood, is sensitivity, or the ability to transmit feel and vibration. Because graphite is a much stiffer material than fiberglass (and because less material and weight are needed), it transmits even the faintest of messages along the blank from the tip to the angler's hand. When casting, he can feel precisely the tug of the line or lure, and more accurate timing is possible. The angler also receives a broader spectrum of vibrations from the line as he fishes the rod, and can better feel and differentiate the bottom and the lightest of "pick-ups" by the fish. When hooked, the increased sensitivity of the rod accentuates every movement of the fish. Not only is pleasure enhanced, but the fisherman is better prepared to counter every challenge of his quarry.

Graphite is also more responsive than either fiberglass or cane. It stores and releases energy more decisively. Combined with the increased sensitivity, it enables a higher degree of control in casting. Better accuracy is more easily obtainable. The fly fisherman will find it easier to cast tight loops, and the spin and plug caster will be able to cast with less loft. This responsiveness and sensitivity will also enable the angler to set the hook quicker, resulting in fewer missed strikes.

At the completion of a cast, graphite dampens better than any other rod-building material. This means the top stops vibrating quickly, eliminating distance-robbing waves in the line.

On a weight basis, graphite is four times stronger than steel and two and a half times stronger than fiberglass. To the designer, this means that less material is needed than in a fiberglass rod of the same strength, and smaller diameters are possible. To the fisherman, smaller diameters mean less air resistance as the rod is moved through the casting arc. With air resistance reduced, more of the force applied by the casting hand is converted into usable energy. The tip speed is increased for greater distance, or less effort is required to cast the same distance.

Comparing bare blanks of graphite and fiberglass, there is a weight savings of 25% to 33%. The finished rod must contain reel seat, handle assembly, guides, and wrapping finish. All contribute weight. Add next the weight of the reel and line, and it can be seen that the weight savings in finished *short* rods is rather insignificant. The longer the rod, the greater the effect of the reduced weight of graphite. It is most noticeable and most applicable in surf rods and the longer fly rods.

As a blank is made longer, a disproportionate amount of weight is added. To keep power equal in the longer rod, the increments of weight added seem way out of proportion to the added length. The tip must remain the same on the two rods, long or short, to handle the same fly line or lure weight. Since the total lever is longer, the added butt must support its own weight. This means the butt must be of a larger diameter and a continuation of the taper of the shorter rod. This is the problem with fiberglass and especially with bamboo. If a lighterweight material, such as graphite, is used, possessing the same strength, substantial weight savings can be achieved. Also, on the longer rod, the smaller diameter of graphite encounters considerably less air resistance than would a long rod of equal length in fiberglass. This is why the weight savings of graphite becomes important on long rods.

Quality graphite blanks also soften less from material fatigue. In a test of 30,000 mechanical flexes designed to simulate casting, fiberglass softened 8%, bamboo 6%, and graphite less than 1%. A well-made graphite rod can therefore be expected to retain its original action, strength, and feel longer than a rod made of other materials.

The danger in viewing the attributes of graphite is that one assumes all graphite blanks or rods are alike. Nothing could be further from the truth. It has been estimated that a graphite blank is about fifty times more difficult to make than a fiberglass blank. Entirely new technology is required. The total performance of any graphite rod depends upon (1) a design that fully utilizes all the advantages of graphite, combined with (2) the production technology that can accurately produce that design.

Both of these subjects can be quite technical and complex. The problem of comparison is further complicated, from the rodcrafter's view, by the fact that both the design and technology of the companies producing graphite blanks are well-guarded trade secrets.

I have been fortunate in this regard in that I have served as a consultant to a number of rod- and blank-making companies over the last twelve years, and have been privy to much confidential information. Naturally, I cannot violate that confidence, but we can discuss here some of the problems associated with graphite construction and the conceptual solutions. I can also call upon personal experience derived from my rod-building supply business where we keep testing, purposely breaking, and "burning-out" graphite blanks made by most all manufacturers. Additionally, for quite a few years we have designed our own graphite blanks, contracting with prime manufacturers to have them made to our technical specifications.

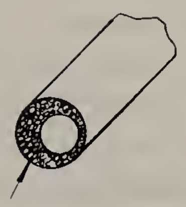
Graphite fiber is made by starting with a synthetic polyacrylonitrile fiber. This is heated first to 200° to 300°C. for stabilization and oxidation, then to 1200° to 1500°C., where carbonization occurs. A series of heating stages follows during which decreasing amounts of oxygen are present. At 2000° to 3000°C. in the complete absence of oxygen, graphitization takes place, forming clusters of crystals. These are then oriented by stretching to make the graphite fiber.

This fiber is extremely fine, as small as .0003 inch. It is produced in continuous lengths of unidirectional fibers. For blank construction, the fibers are impregnated with inert epoxy resin, which holds them in place, and temporarily backed with paper for ease in handling. A 100-foot-by-12-inch roll of this "tape," as it is called, will have each fiber running the entire 100-foot length.

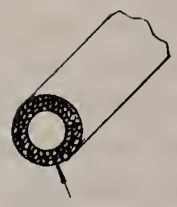
To make a blank, the desired pattern is cut from the tape. The paper backing is removed, and the fiber is wrapped around the mandrel. In order to derive all of the performance characteristics from graphite in a rod, *the fibers must all be aligned with the axis of the blank.* Herein lies one of the greatest problems in making graphite blanks. Let's examine some of the aspects of this problem.

The mandrel for a graphite blank is much thinner than one for fiberglass—at some points only ten times the diameter of a human hair! Since the fibers must run absolutely parallel with the mandrel, wrapping under the required great pressure pushes the thin mandrel into the graphite. When this happens, wall thickness does not remain constant, and weak spots are formed in the blank. It might help to visualize a sheet of plastic drinking straws held together only by a tacky substance. Now, try to wrap layers of this around a thin dowel. You will find it impossible to keep the straws from piling up along one side.

In an attempt to solve this problem, the pattern can be cut from the graphite tape so that the fibers are not aligned with the axis of the blank. Since the fibers and the mandrel are not parallel, the mandrel will not be pushed into the graphite and will remain centered. However, if this off-axis alignment is used—and some companies do use it—the exceptional performance attributes of graphite in a fishing rod are reduced.



no scrim—mandrel pushed to one side—weak wall



scrim used to keep mandrel centered—walls equal

lightweight scrim

conventional glass fabric

Off-axis alignment has other disadvantages. Graphite fibers are very stiff and resist bending. If the fibers are not parallel with the mandrel, they must of necessity be bent and wrapped around the mandrel. As graphite is made into smaller-radius bends, it loses hoop strength. By the time it bends around a diameter of ¼ inch or less, it contributes absolutely nothing in hoop strength. Also, when it is bent severely at the very small tip diameters, the fibers tend to separate from the resin, or delaminate in later fishing use. To compensate for this, companies add more resin and/or fiberglass to the tip section, or even make the tip entirely of fiberglass. When any of these compromises is made we no longer have a high-performance graphite rod. The prime attribute, sensitivity, is lost.

So wrapping graphite fibers off-axis in order to keep the mandrel centered and the wall thickness constant results in a rod with reduced performance characteristics and a rod that may not hold up very well in hard use.

The solution to keeping the mandrel centered is to create a barrier between it and the parallel graphite fibers while they are being wrapped around the mandrel. If there was a layer of light fiber running at right angles to the graphite, it would be impossible for the mandrel to be pushed into the graphite. This has been the approach taken by the best manufacturers.

A fairly open weave of very light fiberglass, generally referred to as scrim, is placed on the side of the graphite tape that will be next to the mandrel. This fiberglass scrim should not be confused with regular rod-building fiberglass, which has a diameter of.005 to.009 inch and weighs from 5.5 to 9 ounces per square yard. Scrim has a fiber diameter of from.001 to.002 inch and weighs from.58 ounce to 1.43 ounces per square yard. The companies with the best production technology can use the lightest of the fiberglass scrim. They also can use graphite tape that is thicker—i.e., has more fibers.

The inclusion of the above small amount of light fiberglass scrim is solely for production purposes to maintain constant wall thickness. It has no effect on rod performance. There is a popular misconception that scrim is added to soften the action of graphite blanks. While the first graphite rods did tend to be too stiff, the stiffness was a result of the tapers used, and has been corrected by taper design—not by additional fiberglass scrim. In fact, the first rods made by Fenwick contained more fiberglass than do their later, more highly refined models.

Graphite-fiberglass blends

There have been attempts by some companies that lacked the production technology to properly handle graphite to blend regular rod-building fiberglass cloth in about equal proportions with graphite tape. The results have been unsatisfactory because of the great difference in the modulus of elasticity (stiffness) of the two materials. Graphite is four times as stiff as fiberglass. It therefore takes four times as much pressure to make a graphite blank attain a certain bend than it would to make a fiberglass blank attain exactly the same bend. Viewing it another way, graphite loads sooner.

If the two materials are combined in a blank, the graphite fibers are loaded when the fiberglass is only 25% loaded. This means the fiberglass is not yet really performing any significant work. Since these blanks are made for marketing reasons with the same small diameters as graphite blanks, there simply is not enough graphite present to do the job. By the time the blank is flexed far enough to load the fiberglass significantly, the graphite can be considerably overloaded and fail.

"100% graphite"

Some companies advertise that their rods and blanks are made of 100% graphite. This can be misleading and bears closer examination. What they are saying is that graphite is the only fiber used. The term "100% graphite" does not tell us how much resin is in the blank. Nor does it tell us how much total graphite fiber the blank contains. To make a complete comparison we would need to know the "volume fraction" of graphite. This fraction consists of the volume of the graphite fibers contained in the blank, divided by the total volume of the blank. It indicates the percent of the total blank that is made up of graphite fibers. If we multiply this percentage by the total volume, we find how much actual graphite is in the blank.

Perhaps we can simplify this by a rough analogy. Suppose we had a box in which there were 100 balls, 50 of which were black (graphite) and 50 of which were white (resin). Let this box represent the "100% graphite" blank. In another box we also had 100 balls, but 60 were black (graphite), 35 were white (resin), and 5 were red (scrim). While the first box could claim to be 100% graphite, since that is the only fiber used, it clearly has less graphite than the second box, which also contains scrim for production purposes. The blank represented by the first box may have some or all of the fibers off-axis to maintain constant wall diameter. If so, we know the associated problems. Or, if the fibers are aligned with the axis of the blank, the wall diameter may vary, making for erratic action and a weaker blank. So, the statement that a blank is 100% graphite is no indication whatsoever that it is a better blank. Usually just the opposite is true.

Different graphite fibers

During the first ten years of graphite rod production, all companies used the same basic graphite fiber. Some, as we've seen, were able to develop a design that fully utilized all the advantages of that fiber and the production technology that could accurately produce that design. They were the few really successful ones. Others, despite their advertising claims, produced less desirable rods. Still others fell by the wayside entirely.

The important point is that graphite fiber had more potential than fiberglass, but the potential had to be *used* before we had a better rod.

Enter now, in the last few years, two new graphite fibers with even greater potential. A company can't just use these new fibers in place of the old. Once again, new design and new technology are needed.

These new graphite fibers are the result of research for the aerospace industry, the largest user of graphite. Specifically, both of the new fibers are higher-strain graphite. The strain rate (PSI) of the older fiber is 450,000 while the new is 650,000. This is a measurement of the strength of the fiber before it breaks under tension (forces that would operate to pull it apart). A properly made rod using these new fibers should have the *potential* of greater flexural breaking strength.

One of the new fibers has the same modulus, or stiffness, as the old fiber, 34 million PSI, and is being referred to as "high-strain graphite." The other has an increased modulus in the range of 42 million PSI, and could be called "high-strain, high-modulus graphite." This increased stiffness, or resistance to bending, has the *potential* to allow the use of less material and smaller diameter in a rod.

We are talking *potential* because these are the tensile properties of the bare fiber alone. Before we can consider how each might improve a rod, they must be combined in a fiber/epoxy composite—which opens the door for a multitude of other factors and variables. This is much too complex a subject for our discussion here, but let me share one simplified example.

Of the two new graphite fibers, the one with the increased modulus, the "high-strain, high-modulus graphite" would appear to be the logical choice for making a better rod. However, as of this writing there is no resin system available for rod building with a high enough shear strength to properly bond the higher-modulus fibers together. To make a blank from this fiber, more resin and more fiberglass scrim must be used than in a blank of traditional or high-strain graphite. By so doing, the performance of the resultant blank is lowered to standards not too much above the traditional. The *potential* is there, but the blank manufacturers are not yet in a position to make full use of it.

Interestingly, though, a couple of companies are using it, handling it as just mentioned. While their blanks perform only marginally better, they feel the advertising value is worth it in what one calls the "technically expectant" rod-buying market. We'll discuss this attitude of some buyers below, under Boron.

Woven graphite

As noted above, graphite fiber is produced in continuous lengths of unidirectional fiber. Until a few years ago, it was available to rod companies only in this form. The blank maker could specify to the graphite manufacturer the specific resin he wanted the fiber impregnated with and how he wanted it laid up. However, there was no woven graphite material with fibers running at right angles to one other, as in the case of fiberglass. As we've seen, a whole new technology had to be developed to handle unidirectional graphite tape.

Today there is a special graphite material that is woven before it is resin-impregnated. This is not made by alternating directions of one fiber at a time, because graphite fibers are so very fine (.0003 inch). Instead, bands of many fibers are arranged and woven at 90° to each other.

In many respects, this woven material is easier to work with from a tubular manufacturing standpoint. However, it has a very interesting limitation that is common to graphite fibers in any lay-up. The idea behind a woven material is that the so called transverse fibers, those oriented at 90° to the axis of the blank or running around the blank will provide hoop strength. This has always been the case with fiberglass. It works with graphite, however, only on large-diameter tubing. As the diameter decreases, the hoop strength decreases until the diameter reaches 1/4 inch. At that point the transverse fibers contribute *nothing* to hoop strength.

Woven graphite is limited to blank diameters in the neighborhood of one inch or greater. At that size, the walls can be substantially thinner than with unidirectional graphite, providing a decided weight saving. It is also attractive cosmetically. The problem is simply that most rods have very little or no sections where the diameter is one inch.

Graphite ferrules

Integral tip-over-butt ferrules are presently used by most blank manufacturers. They have proven to be the strongest and best liked by fishermen. They may look the same to the untrained eye, but there are differences in the way they are made. On some blanks, the taper to form the female ferrule starts all the way up on the tip section. On other blanks, the taper starts only a few inches above the ferrule. This latter method is a bit better because almost the entire tip section can be tapered as needed to produce the desired action. It is not seen on all graphite blanks because it requires specialized equipment and technology.

Most all female ferrules are reinforced when the material is wrapped around the mandrel. At that time a small piece of material is wrapped around the female ferrule with fibers at a right angle to the blank's axis. This is to provide additional hoop strength. As we've discussed, when graphite fibers are used they will provide no hoop strength if the diameter is 1/4 inch, and only a small amount at slightly larger diameters. The strongest way to reinforce the ferrule is with a small piece of fiberglass. This can be bent to extremely small diameters, if needed, with no loss in hoop strength.

To give you an idea of how ridiculous this whole thing can get, some blank companies will use graphite and a lot of resin instead of the stronger fiberglass so they can say that no rod-building fiberglass (just scrim) was used in making the rod.

From a custom rod-building standpoint, we should wrap the *female* ferrules on all rods to assure additional hoop strength. In order to keep the bulk to a minimum, use either size "00" or "A" thread. Do not use thread tension any greater than that used for wrapping the guides or you will run the danger of constricting the size (or opening) of the female ferrule. When that happens, the male section of the ferrule will not penetrate as far as it should and a potential shear point is created where the rod may break.

Apogee graphite blanks

Quite honestly, I debated whether I should even mention Apogee blanks because they are proprietary to my supply business and were designed by myself and my manager, Dick French, with the assistance of a number of RodCrafter friends. It's hard enough wearing two hats. Apogee is our trademark for an extremely innovative concept in blanks, and I didn't want to be accused of blowing my own horn to sell my own products. However, the blanks are totally unique and have been accepted especially well by custom rod builders. RodCrafter friends who knew I was working on the revision of this book felt it would be an important error of omission if I did not discuss the blanks. So—here goes.

We started with the design concept a number of years ago in an attempt to make a true ultralight graphite blank. This was to be a blank that honestly could cast a 1/32-ounce lure. The tip had to be made lighter so that it would deflect under such a light load. The problem was you could only make the walls so thin, then they collapsed in use. We came up with the idea of using the same amount of graphite in the tip section, or even a bit less, but making it *solid* instead of hollow.

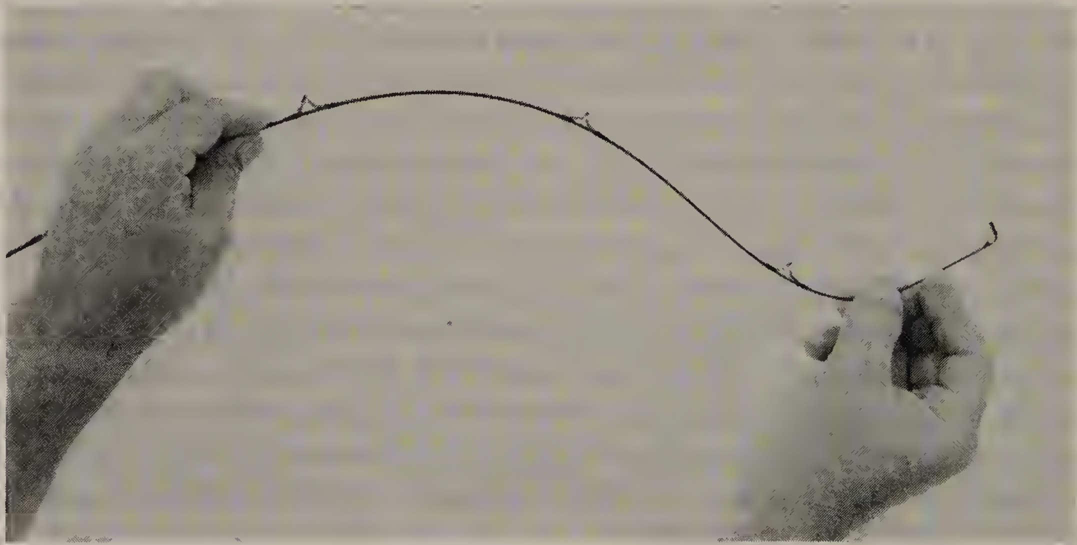
The tips were made of a solid cylinder of graphite, which was then ground to form the various tapers. The diameters of these rod sections were exceptionally small, only about 3/64ths at the tip. The thin profile could slice through the air with much less resistance than bigger-diameter hollow blanks. This reduced the loss of energy put into the blank by the caster. It also meant that a very light weight could load these delicate tips. They were delicate in the sense that they would cast 1/32 ounce, but more rugged than regular hollow tips because they were solid. There were no walls to collapse or crush.

The initial ultralight spinning blanks were called "Fleaflickers" and were offered in two models: five-foot and six-foot lengths. Using two-pound test line, Dick and I cast 1/32 ounce an average of 45 feet. What surprised us at first was that when we put a lure weight of 1/8 ounce on the rod it did not overload it. Instead we hit as high as 110 feet. The complete rod weighed 1 1/3 ounces. We had fifty blanks made up and offered them to attendees at the National RodCrafter Seminar who were interested in helping us test them, and the following year we listed them in our catalog.

The light, slim tips, when married to the proper tapers of hollow graphite, were unique in their ability to cast exceptionally light, delicate lures on one hand, and much heavier than normal lures on the other. This got us started in an extensive design program for fly-rod blanks that spanned a few years. Along the way we designed and added an ultralight casting blank and an ultralong (11 1/2 feet) steelhead ultralight (noodle type) blank for two- to ten-pound test. On the latter, the blank's exceptionally wide range had the delicacy of two-pound in slower streams and the heft of ten-pound to fight big fish in fast water.

In fly fishing you cast the weight of the fly line. A rod is rated for the weight of the first 30 feet of line. On very short casts of 20 feet, you have only a few feet of line in the air to load the blank. Assume an eight-foot rod and nine-foot leader and you are using about three to five feet of line. It weighs practically nothing. On the other hand, cast to a target 60 feet away and you have a comparatively heavy weight loading the rod. We set out to design fly rods that would comfortably fish in close (tiny weight) and just as comfortably fish at a long distance (heavy weight), something very few rods were capable of doing.

The slim profile of solid graphite tips performed even better on the fly rods. One reason was that the rods were longer and could generate much more tip speed slipping through the air than could large-diameter hollow graphite. The speed of the tip is what determines casting distance. After much experimenting and design work, we were able to produce fly-rod blanks that excelled in their ability to cast both light and heavy weights.



The extremely thin, solid graphite tips on the Apogee blanks are delicate enough to cast a #4 weight fly line or 1/32 ounce, yet rugged enough to be forced into this "S" curve.

So much so that our eight-foot blank could cast *all* fly-line weights, from a #4 to a #9, and our nine-foot blank handled *all* lines from #5 to #9.

Not only did the very slim profiles slip through the air faster but they "tracked" better than conventional blanks. This ability of the blank's tip to flex more at the peak of the load, then recoil positively, produced a very tight line loop. This effect is so pronounced that if the caster tries to power the rod, he will get too tight a line loop. The caster must relax, go easy, and let the rod do the work. This, too, is a very unusual characteristic for a graphite blank.

I'll stop here with the statement that these blanks incorporate a whole new technology and do things that, until now, simply could not be done.

BORON

When graphite came on the scene in production fishing rods in the mid- and late '70s, the impact was incredible. Not only did rod companies develop new technology for working with graphite, but in the process they sharpened their abilities to design better rods. The resulting differences in performance between old fiberglass and new graphite was truly astounding. Within a short time, it seemed as if every fisherman wanted to switch over to graphite rods.

The rod-manufacturing companies never had it so good. Sales were going off the top of the most optimistic charts. Graphite rods were definitely high-ticket items and the profits were correspondingly high. Some of the companies had to do something unheard of—put on a separate night shift.

Of course, after a few years of this, the people who had wanted to switch to graphite had done so and the market shrank back to normal size. Night shifts were laid off and sales returned to business as usual. Not, however, without thoughts of "Oh, how good it was!" and "What can we do to make it happen again?"

Boron was another man-made fiber developed at about the same time as graphite for the aerospace industry. It had a modulus (55 million) higher than graphite with about the same tensile strength as graphite. The possible potential was there to build a better rod—and the climate was right.

The rod companies were certainly looking for something that would give sales a boost. All of us had become accustomed to the rapid-fire technological changes that had affected our lives in recent years. It is not surprising, then, that more than a few fishermen reasoned: "Look at the gigantic improvement in performance that graphite has given us over fiberglass. Now here's another new material that will give us just as great an improvement over graphite."

Unfortunately, this was just not so.

This attitude on the part of some fishermen is what I referred to earlier as the "technically expectant" market. These people have to realize that any improvement in performance capabilities that boron might have provided, or that the newer graphite fibers may provide, is *much, much smaller* than the dramatic improvement of graphite over fiberglass.

Let's look at some of the blank-making problems associated with boron. The diameter of the fiber is about .005 inch, comparable in size to fiberglass and much larger than graphite at .0003 inch. The fact that boron fibers are much stiffer and much bigger makes it very difficult to bond them adequately to one other. In the space occupied by one boron fiber, you could place about 16 graphite fibers. This means you have more surface area of graphite fibers that can be coated with epoxy resin, tightly binding the mass together.

Comparably sized fiberglass fibers can be bonded together because they are only about one eighth as stiff as boron. It has been estimated by one blank designer that a resin system with a shear modulus of 75,000 to 100,000 and compatible with boron would be needed to effect the desired bonding. Unfortunately, a resin system meeting those specifications just does not exist today.

In actual practice, what happens when a hollow blank is made entirely of boron with present resins is that the resin breaks down after much use. The very stiff fibers then slip alongside one another as the blank is flexed. In effect, delamination has occurred and performance is ruined. This is why no one makes a hollow blank of all boron.

The method used by the best blank makers is to sandwich one wrap of boron around the mandrel between several layers of graphite and fiberglass scrim. Rolled under great pressure, this greatly increases the surface area on each side of the boron to which the resin can bond. Notice that the amount of boron, or its percentage of the total blank, is of necessity not very large (about 12% to 17%). Advertising claims of quite high percentages of boron simply are not true.

That was the method used by the best, most technically experienced and advanced companies. Quite a few manufacturers limit the use of boron to the butt section only since that portion of the blank flexes the least, thereby stressing the resin the least. Even there, a complete wrap of boron around the entire length of the butt mandrel is rarely used. Most often, long triangular or wedge-shaped pies of boron tape are cut and inserted in the pattern comprising the butt section. Percentages of boron in these blanks is extremely low—but they all are called boron rods.

A lot was written about the performance characteristics of boron. Other than a possible slight increase in stiffness and power, there appeared to be little consistency in what the writers reported. Personally, I believe this is because any differences noted in rods containing boron were principally *design* characteristics and not attributable necessarily or solely to the boron content. (After all, there really wasn't much boron in the rods). In order to get the boron in, the blank had to be designed and made differently from other blanks in the company's line. These are the differences that were really noted.

As of this writing, boron is being phased out as a blank material by the major rod companies. It is being replaced by newer designs in graphite and by the newer graphite fibers. Boron had the *potential* but it could not be utilized because of a lack of production technology—and that's something we all should keep in mind as we view the new graphite fibers and those just over the horizon.

"S" GLASS

Surprisingly, the advent of graphite contributed substantially to improvements in a special type of woven fiberglass known as "S" Glass. After graphite had become the hottest-selling item to hit the rod industry, the fiberglass producers developed this more highly refined fiber. Among other things, it has a modulus about 25% higher than regular fiberglass and a strain rate 38% higher.

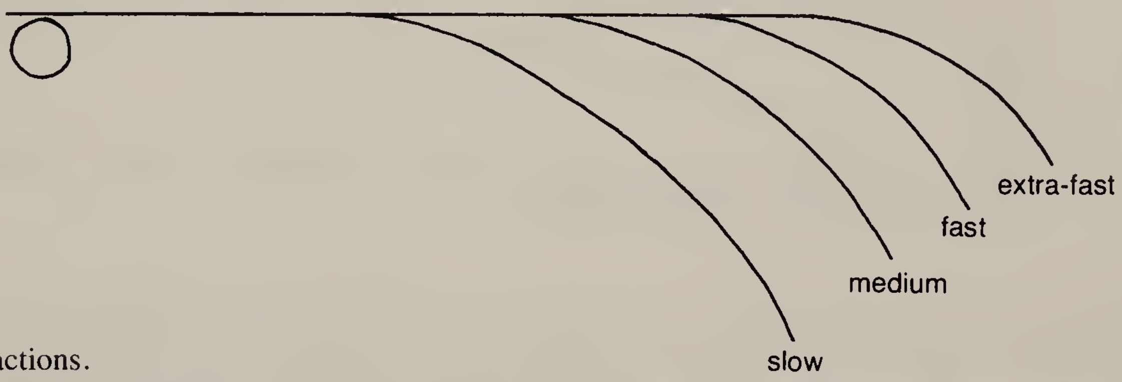
As we have seen, good graphite blanks are much more difficult to make than fiberglass. New technology and equipment had to be invented, and new design skills developed. After this production capability was established, a few blank makers turned their newfound skill and more sophisticated machinery loose on "S" Glass. They found they could produce a markedly superior fiberglass blank.

It was now possible to use less material in a blank, reducing weight and mass and improving performance. Rods made of "S" Glass are more sensitive than those of regular fiberglass. At the end of the cast they also dampen, or stop oscillating, more quickly. This eliminates distance-robbing vertical waves in the line.

To put "S" Glass into perspective, it is the finest fiberglass available and can be made into excellent rods by manufacturers with advanced skills and equipment. While it is a definite improvement over previous fiberglass, it is not as dramatic an improvement in raw material as graphite. Had it been available before graphite appeared, one can only speculate that the industry as a whole might have done more with it.

BLANK ACTION

Before getting into a discussion of the different tapers and their effects on action, we should first review the basic definitions of action. This way we will be sure we are referring to the same terms. Extra-fast action means that just the top 25% of the blank bends in casting the weight for which it is designed. Fast action means the top 33% bends, moderate action means the top 50% bends, and slow action means a progressive curve along the entire blank and all the way down into the top of the grips. Over the years there have been many other terms used to define action, particularly on fly rods. Many, as we will see, were combinations of compound tapers—some successful and some not. For our purposes in evaluating today's blanks, the definitions given above are best used.



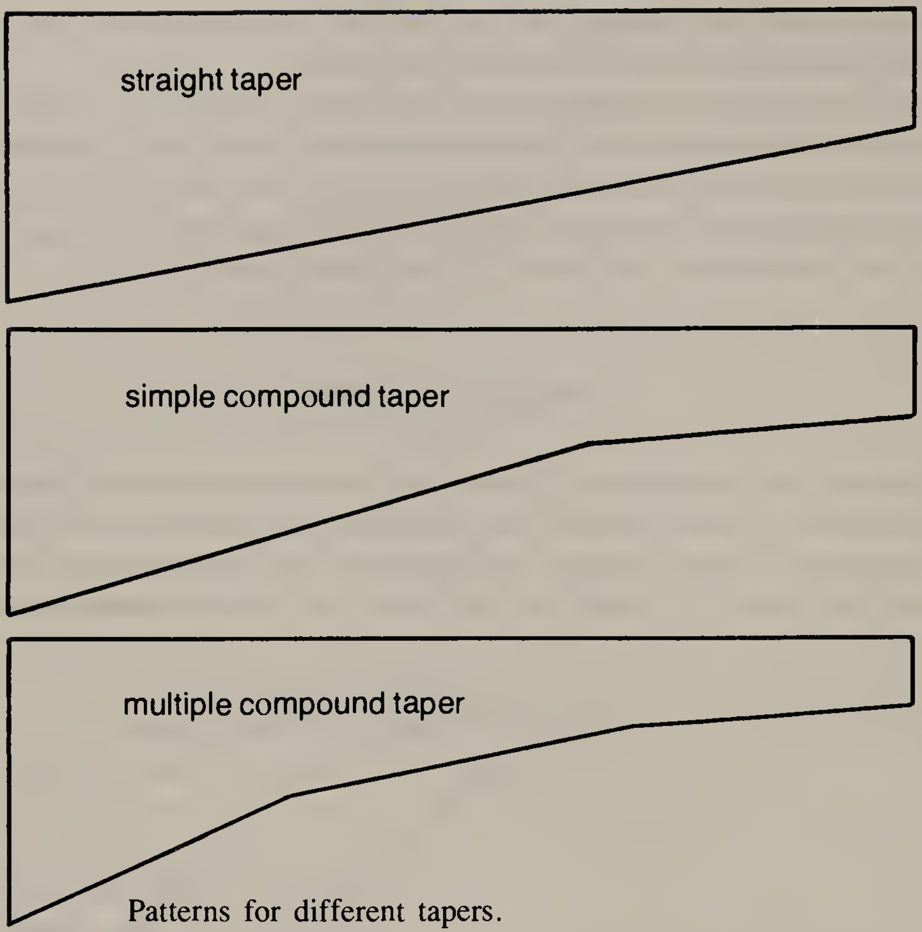
Blank actions.

As noted earlier, the amount of material composing the wall of the blank at any given point determines its stiffness at that point, and therefore the overall action. This is achieved by cutting the cloth or tape into patterns of different shapes. A straight taper has an even progression of additional fiber added to the walls of the blank from tip to butt. As the illustration of the pattern shows, the angled side of the pattern is straight. In its purest form, a straight-tapered blank will have a slow to medium action with flexing occurring progressively over all or almost all of its length.

A compound taper is one in which there is at least one change in the angle along the side opposite the straight side of the pattern. The taper changes along the length of the blank. If a fast-action blank were being made, the pattern would have comparatively less material in the top third. At that point the pattern would widen rapidly to provide more stiffness over the remaining length of the blank.

There can be many variations and/or combinations of different individual tapers in a compound-tapered blank. For example, the tip could be light and fast, then the midsection and the upper part of the butt section could have an even progression of additional fiber, and finally the butt itself could be made quite stiff by the rapid addition of material.

A number of different techniques can be used to identify the action of a bare blank



Patterns for different tapers.

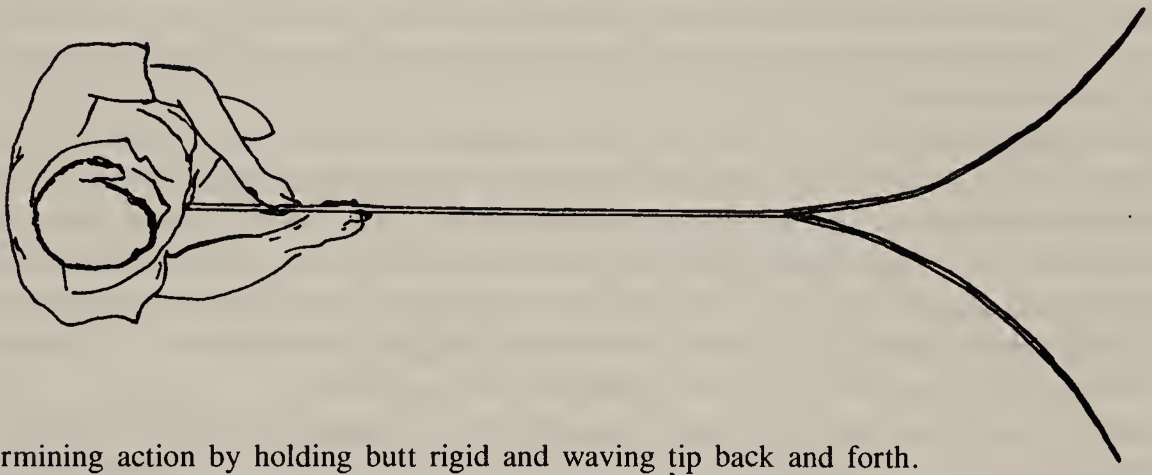
and judge its applicability for the rod to be built. With all of them, experience is required. Top-quality manufacturers provide not only the statistical measurements of butt, mid, and tip, but also terms regarding the action of each blank. Mail-order companies specializing in rod-building supplies will often add further descriptive information. My experience has been that this information is an excellent basis on which to make a selection. Keep in mind that both the manufacturer's and the dealer's reputations are at stake. The last thing either wants is to mislead you. Your repeat business is dependent upon their ability and willingness to be of assistance. This is particularly true of the dealer specializing in rod-building components.

In examining the statistics and information provided in a catalog, you can tell quite a bit about the blank. The description of action from extra-fast to slow will generally be indicative of the type of taper. Faster actions are made with compound tapers and slower actions with straight tapers. Assuming the blanks are made from the same material, such as high-density fiberglass, you can compare two different blanks of the same length designed to handle the same lure weights.

For example, if you found two $6\frac{1}{2}$-foot spinning blanks, both designated for lure ranges of $\frac{1}{8}$–$\frac{3}{8}$ ounce, you would check the statistics. The first has a butt diameter of .635 inch, a mid diameter of $\frac{20}{64}$ inch, and a size $5\frac{1}{2}$ tip. The second blank has a .555-inch-diameter butt, the same mid diameter of $\frac{20}{64}$ inch, and takes a size 6 tip. Since the first has a comparatively larger butt diameter and a smaller tip diameter, you would expect its action to be faster than the second. You would also reason that the first has to be of a compound-taper design with changes occurring somewhere both in the butt section and in the tip section. This would be borne out by the company's listing for the action—the first is rated extra-fast and the second moderate to slow.

Judging blank action

Once you have the blank in hand you can judge its action by the following process. Hold the blank parallel to the floor, with the butt firmly against your stomach. Start a side-to-side motion with minumum strength and pressure. Then progressively increase the pressure until the maximum flex is attained. By observing the curvature of the blank during this process you will get a fairly accurate picture of the action as we have previously classified it. You will also see how the blank reacts under increasing loads (see drawing).

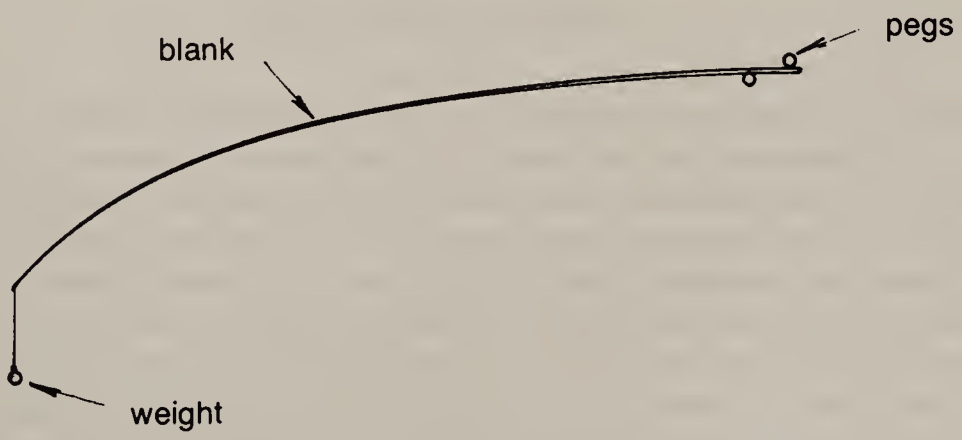


Determining action by holding butt rigid and waving tip back and forth.

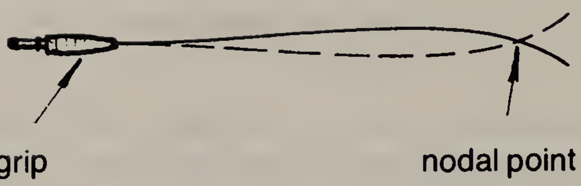
Some experienced rod builders with an "educated hand" can get an indication of the action by holding the blank by the butt and pointing it up at about a 45° angle. They then press the tip against the ceiling and increase pressure with the hand to put a bend in the blank. The need for an "educated hand" comes into the picture to determine how much pressure to apply to simulate a blank fully loaded with the weight for which it was designed.

A similar method used far less today than it once was is the static deflection test. Here a large wall area is employed with two pegs or similar braces that hold the butt on a flat horizontal plane. A fairly heavy weight is then suspended from the tip—this weight is considerably heavier than the weight to be cast by the rod. The arc described by the blank from the weight is supposedly indicative of the action of the rod.

Both of these last two static methods are helpful to only certain rod builders. The



Static deflection test.



Dynamic properties of blank.

amount of hand pressure in the first and the amount of weight suspended in the second obviously have to vary with light and heavy rods, and all the subtle gradations in between. It should be kept in mind that both are *static* tests in which the rod is not flexing. Such methods of evaluation will not necessarily indicate how the blank will perform when it is actually used in casting.

The casting property of a rod is really a matter of *dynamics* rather than static mechanics. When a rod is moving, as in casting, it becomes subject to the effects of acceleration, momentum, impact, and even rotation. It could then be described as a beam with cantilevers, or supports, at both ends. The first support is the hand holding the butt. The second is the nodal point near the tip. The nodal point can be easily seen if the rod is set in fairly rapid motion by a loose side-to-side wiggling of the hand. It is the point where the force applied to the rod is translated into tip motion.

Since dynamics are key, the initially described test of moving the blank from side to side will tell you more about the *action* than will the static methods. The best policy is to use all the tests you feel necessary to help evaluate the many properties of the blank such as strength, stiffness, weight, etc.

Another technique to help evaluate a blank and classify its taper is to locate the "drops." As we have seen, on compound-tapered blanks there will be one or more points where the wall thickness changes rather rapidly because of a change in the angled side of the pattern. By running your fingers along the blank these rapid changes, or "drops," can often be felt. It helps to place a thin piece of cloth (preferably slippery synthetic) over the blank and between thumb and forefinger. This reduces friction from bare fingertips yet will permit the sensitive feel necessary. In and of itself, this test will certainly not tell you how the blank will cast. It will aid in directing your attention to appropriate sections when you perform a dynamic flex test. It can be quite helpful in evaluating whether or not to trim a blank, which will be discussed later.

Choosing a blank taper

Having defined tapers of blanks, we need to understand what generally can be expected in performance from each type, since each has its advantages. Compound tapers are used on extra-fast and fast-action blanks. They will handle a slightly wider range of lure weights than will slower, straight tapers. If too fine a tip is used, there will be a tendency for the tip to vibrate at the end of the cast. Tip vibration causes waves in the line and added friction of the line against the guides. Casting distance will be reduced as a result. As the load, or weight cast, is increased beyond the range for which the blank was designed, the lighter tip breaks up the progressive, uniform bend. Unable to handle the excess weight, the tip "collapses" and becomes useless and a disadvantage in casting. Another aspect of compound tapers is that it is more difficult to predict the results of trimming a blank.

Straight tapers, or tapers very similar, are used on slow- or moderate-action blanks. They form the basis for the progressive class of actions. They are slightly more restrictive in the range of lure weights they will cast. Tip vibration is rarely a problem. While they will reach the upper limit of their ideal lure weight range sooner, the tip will not "collapse," and a lobbing, more slowly timed cast can then be used with fair success. If you are contemplating trimming the blank, the results are easier to predict than with compound tapers.

In the final analysis a blank should be selected for maximum performance with the lure or line weight normally to be cast and at the distance normally cast. It should not be chosen, for example, for maximum casting distance—unless that is the primary function of the rod to be built. Selection should be based on how efficient the rod will be for the work that is to be done by it in the hands of the person who will fish it.

When evaluating blanks from which to build a given rod, knowledgeable builders do not confine themselves to just one classification of blanks. For example, many exceptionally fine ultralight and light spinning rods are built on blanks designated as fly-rod blanks by the manufacturer. In order to get some idea of the general lure weight range of a fly blank used to build a spinning rod, you can refer to the table below. This is simply the conversion derived from the midpoint in the range of acceptable weights for fly lines as designated by the American Fishing Tackle Manufacturers Association (AFTMA). The weights for fly lines are given in grains, which have been converted into ounces at the rate of 437½ grains = 1 ounce.

Fly Line No.	*Grains*	*Ounces*
1	60	9/64
2	80	3/16
3	100	7/32
4	120	9/32
5	140	21/64
6	160	3/8
7	185	27/64
8	210	31/64
9	240	35/64
10	280	41/64
11	330	3/4
12	380	7/8

In using the table, treat it as a rough guide only, since manufacturers may adjust their lure- or line-weight rating for a particular action. The tapers used for fly blanks are more often in the general classification of straight tapers and are more likely to have moderate to slow actions. This is what makes certain rod builders prefer them, especially if they cannot locate this type of action in blanks designated for spinning.

It is, of course, also possible to build fly rods from blanks designated for spinning. In the lighter spinning blanks the action usually tends to be too fast for a fly rod. However, if you encounter a customer who has a strong preference for a stiff, fast-action fly rod, you might consider starting with a spinning blank. Usually the finished fly rod will be for heavier, saltwater use with fly-line weights of 9 and up. Those blanks that work best for the average caster are of moderate to slow action. Tournament casters, on the other hand, may prefer the faster-action stiffer rod. They have the necessary skill to handle the more critical timing and bring out the full power in the blank. Distance is, of course, their game, not fishing pleasure, and their requirements are therefore different.

Variations from blank to blank

Most custom builders know that no two blanks of the same model will flex or perform exactly the same. The differences will range from very slight to occasionally sizable. This is, of course, why it is necessary for the custom rod crafter to evaluate *each blank* as he builds the rod, making various adjustments to ensure that he ends up with exactly the performance desired. I have received quite a few inquiries about why these variations exist among even the highest-quality blanks. It is often helpful for the custom craftsman who sells his rods to be able to explain something about these differences so that the customer better understands why a custom rod is superior.

First off, the mandrels are longer than the patterns which are wrapped around them. Some patterns for the same blank will be wrapped a bit higher on the mandrel, and others a bit lower. Also, blanks are made slightly longer on each end than the length of the finished size. This makes it easier to handle them through the various steps and controls quality. The ends are then nicely cut to produce the given size. However, the final trimming will not always be in exactly the same place on each blank. For example, one 7-foot blank could be cut with more of the finer tip section while another 7-foot blank of the same model might have been cut with more of the stiffer butt section.

Despite the most modern sophisticated equipment and best-trained operators, there will be slight variations in exactly how tightly the pattern was wrapped around the mandrel. The pressure might not be precisely the same all along the blank, or at all times while this wrapping is performed. Similarly, the pressure can vary slightly as the cellophane is wound in place.

When the blank is sanded, the possibility for yet another small deviation comes into play. The objective is to remove just the excess resin that molded itself to the shape of the cellophane wrap. But as we have seen, a small number of the fibers are also sanded and, in the process, fractured. This can occur the least bit more on one side of the blank than the other, or more at one end than at the other.

On factory-ferruled blanks, there are bound to be small differences in otherwise identical blanks. This is true regardless of the type of ferrule. On the various tip-over-butt ferrules, the female section on one blank will fit farther over the male section than on another. With internal plug, or "spiggot" ferrules, the position of the plug will vary slightly toward the tip or the butt.

This is but a partial list. Every stage in blank manufacturing introduces variations. Keep in mind that all of the deviations are quite small. It is the cumulative effect that can be significant—how many tend to cancel each other and how many amplify each other. Viewed in this perspective, it is easy to see why it is rare indeed for two blanks to flex exactly the same.

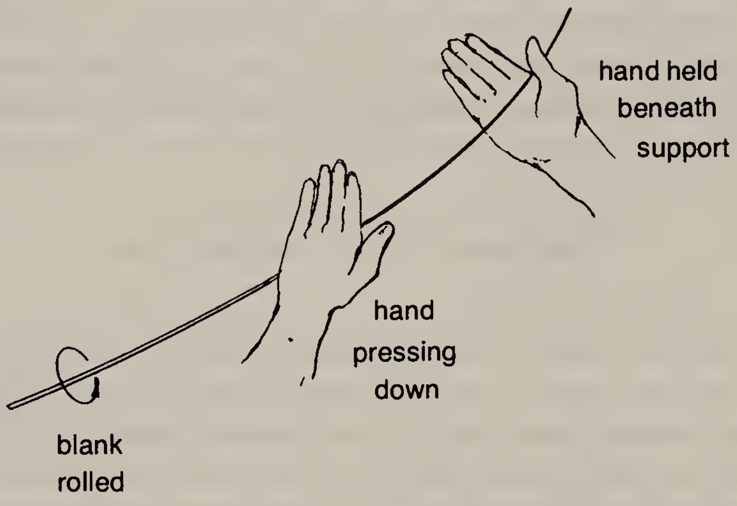
ALIGNING THE BLANK

Before proceeding further with our exploration of the blank, we need to discuss the effective spine and how it should be aligned with the guides on the finished rod. Just about every blank has what is variously called the "high side," the "stiff side," or the "spline." Of the 360° around the circumference of the blank, there is one point that seems to run along the axis that appears to be more rigid or more stiff. We will call it the "effective spine."

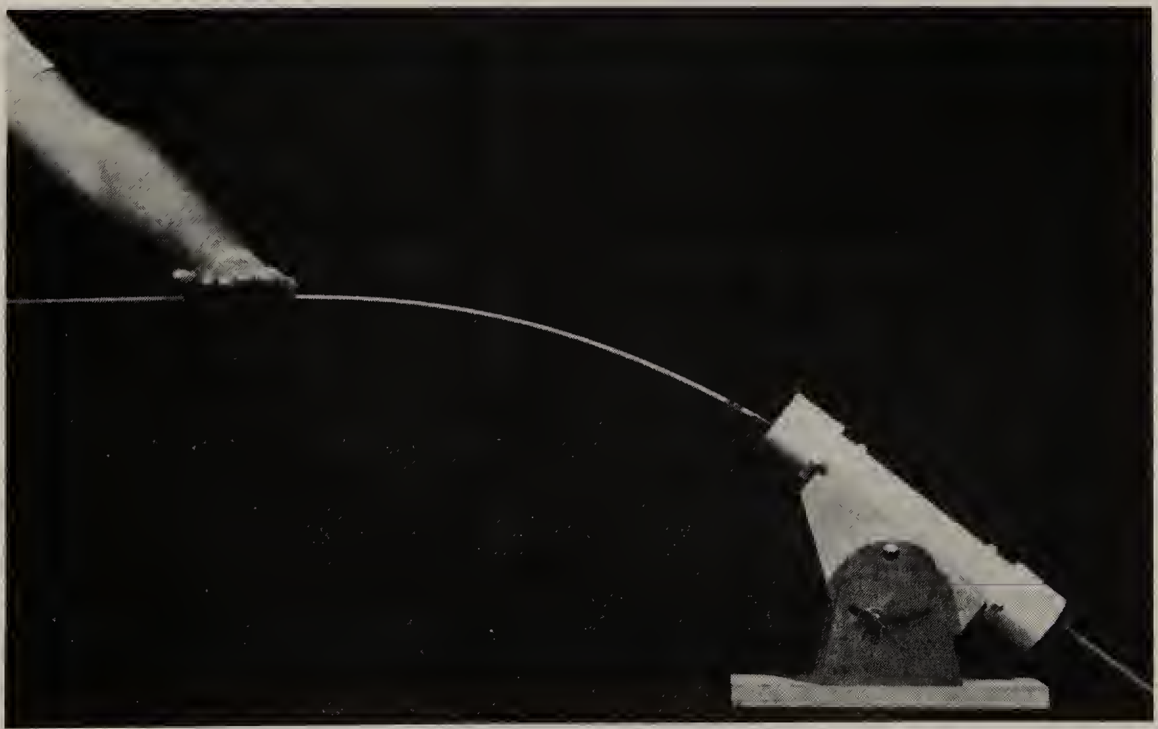
In some cases, the effective spine will be quite pronounced and in others it will be barely detectable. In a few there will even be two effective spines, with one more prominent than the other. The effective spine is a result of the production deviations just discussed. As such, it is not consistent along one axis but migrates throughout the blank, varying in intensity. What we perceive as the effective spine is really the *average* of many different forces operating in many different directions.

Locating the effective spine

Until 1981, when RodCrafter Ko Watenabe invented the Spine Finder, most all of us located the effective spine as I explained in my book *Fiberglass Rod Making*—that is, we held the blank at about a 45° angle with the butt resting on a smooth, hard surface. The open palm of the left hand supported the tip section from beneath. The fingers of the right hand pressed down the middle of the blank, bending it slightly and rolling it back and forth. In so doing, we found a point where the blank seemed to jump or produce increased resistance against our right hand. This point was the effective spine.



Locating spline



When a blank is placed in a Spine Finder, it is completely free to roll on ball-bearing raceways. Push down on it and the effective spine will roll to the top.

The method was, and still is, a good way to locate the effective spine, provided the supporting left hand is placed all the way at the tip end of the blank. You will then get the average of all the forces over the entire length of the blank. If, as I was prone to do prior to 1981, you support the blank a couple of feet below the tip, then you will get the average only from that point to the butt. You will have missed the most important section of the blank, the tip, and your reading of the effective spine may well be off.

It was Ko's Spine Finder that clarified so many things with its unerring accuracy. The tool consists of a short tube with two ball-bearing raceways, one in each end. The butt end of the blank is inserted into the tube and is supported there by the two raceways. It is completely free to roll. If you push down on the tip (or hang a weight from it) the blank will roll to a point where the effective spine is directly on top. As long as you keep the blank loaded by pressing the tip downward, the blank will remain in that position with the effective spine on top. With your other hand you can roll the loaded blank between your thumb and index finger and feel the torsional force twisting the blank back to that one position. We can say, then, that *the blank will always seek to turn itself so that the effective spine is on the side opposite the load.*

We can use either a Spine Finder or the hand method to locate the spine. Place a piece of masking tape around the blank and use the side of the point on a lead pencil to mark it. If using the hand method, make sure the butt end of the blank is cut cleanly at a right angle. If not, cut it with a fine-tooth saw, then dress it with a flat bastard file.

Positioning guides and reel seats

The position of the guides and reel seat relative to the effective spine is very important and one of the ways in which custom rods are superior to factory rods. To understand why, let's return to our example of a loaded blank in a Spine Finder. The load could be your hand pushing down or pulling down the tip. Or it could be a fish pulling on the lure, which in turn pulls down the rod. In all cases, the rod will rotate so that the effective spine is opposite the load, on top of the blank. It will, that is, if it is free to rotate. If not, for example if held in the hands of a fisherman, it will still try to rotate. The torsional forces are still present, trying to place the effective spine on top of the rod. Anyone who has fought a large ocean fish with a rod on which the spine has not been located on the side opposite the fish (the top) can attest to these torsional forces. Only part of his effort is directed at fighting the fish. The other part is expended trying to keep the rod from turning.

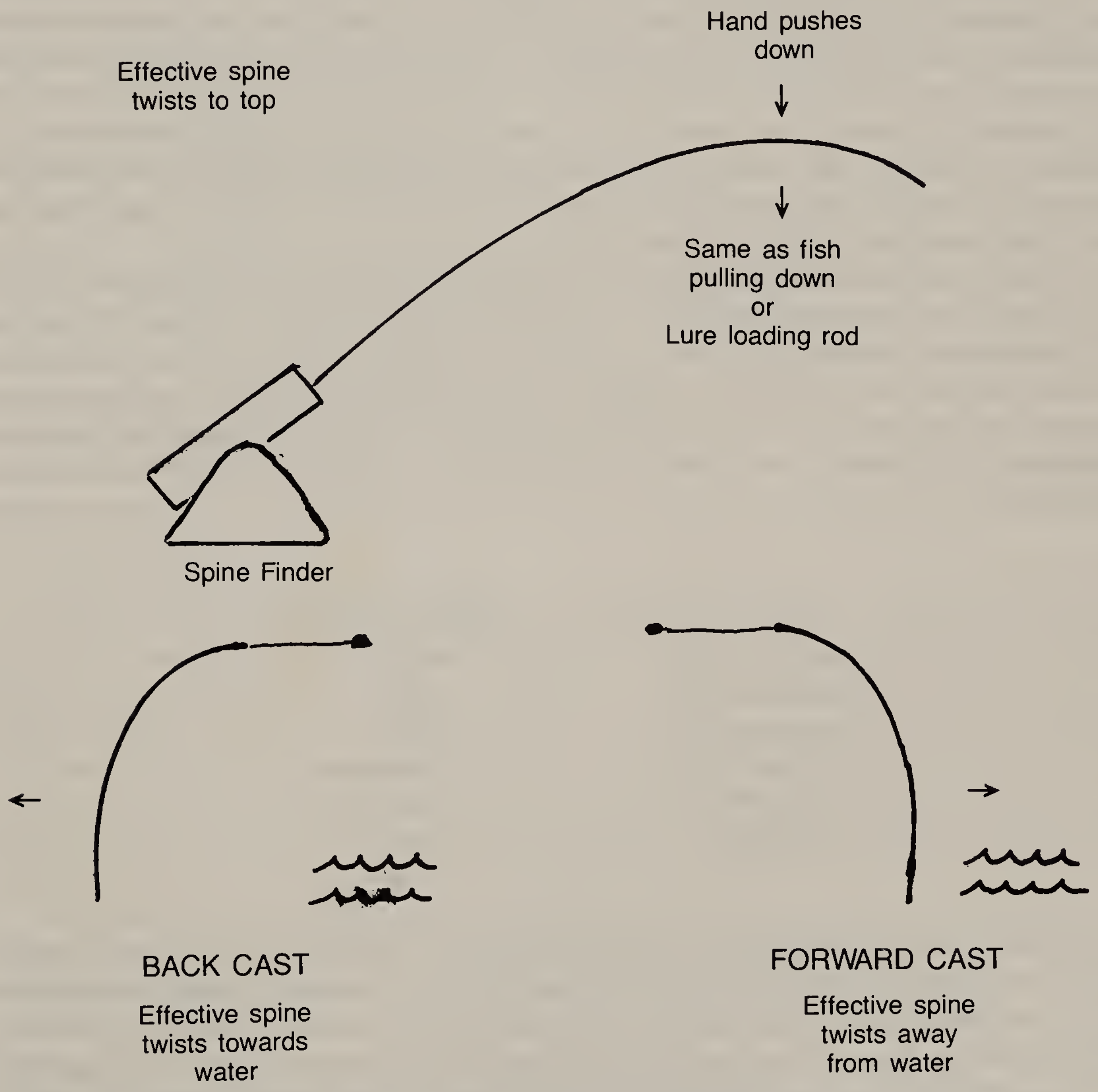
If we were aligning the blank on a conventional-reel boat rod for bottom fishing we would make sure the effective spine was on top—the side opposite the load—by placing the guides on the effective spine. Then, when a fish loaded the blank there would be no twisting since the effective spine was already opposite the load. The rod could then be said to be dynamically stable. Please note that the assumed rod uses a conventional, revolving-spool reel.

Let's change one thing in our example by assuming a spinning reel is to be used. The rod is still for bottom fishing. The guides on a spinning rod are underneath the blank. We want the effective spine opposite the load (the fish), so we place the guides opposite the effective spine, or 180° around the blank from it.

It either case, the ideal position of the rod in the hands of the fisherman has not changed. The effective spine is on top, away from the water and opposite the load. The location of the guides on that rod changed only because a different type of reel was used. Since a fly rod also has the guides on the underside of the rod, alignment strictly for fish-fighting comfort and ability would dictate that the guides also be placed on the side opposite the effective spine.

We can summarize what we have found to this point. *To align any rod primarily for fish-fighting comfort and ability, the guides should be placed so that the effective spine will be on top, or away from the water.* Rods where fish-fighting considerations are most prominent are boat and trolling rods, saltwater spinning rods, and saltwater fly rods.

So far we have talked only about a fish loading a rod. In that situation the angler pulls up, attempting to lift the rod; the fish pulls down; the rod tip bends toward the load (the fish); and the blank rotates so that the effective spine is opposite the load. Well, the same thing happens during a back cast. The angler pulls and moves the rod away from the water; the weight of the lure or fly line trailing behind pulls toward the water; the rod tip bends toward the load (the lure weight); and the blank tries to rotate so that the effective spine is opposite the load. The drawings may help clarify this.



Lure-weight loads the rod in the cast just as the hand loads the blank in a Spine Finder.

On the backcast, then, if the effective spine is located on top of the rod this becomes the side of the blank away from the water—and opposite the load (lure weight). This is the position in which the rod is dynamically stable, and the blank will not twist or turn. However, if the effective spine were located on the underside of the rod, this would be the same side as the load (lure weight). Forces will cause the blank to twist and turn, thereby casting the lure off to one side or the other.

On the forward cast, the angler is moving the rod toward the water; the weight of the trailing lure or fly line pulls away from the water; the rod tip bends away from the water; and the blank tries to rotate so the effective spine is opposite the load.

On the forward cast, if the effective spine is located on the underside of the rod, this becomes the side toward the water and opposite the load. The rod will be dynamically stable and will not twist or turn. The cast will be delivered with the most accuracy. However, if the effective spine is located on the top of the rod it will be on the same side as the load. Forces will cause the blank to twist, thereby casting the lure with less accuracy.

While casting, then, *the greatest accuracy during the forward cast will be achieved with the effective spine on the underside of the rod, or toward the water*. Placing the effective spine in this position is the exact opposite of where it would be placed for fish-fighting ability. The rod builder, then, has a choice. He determines which will be most important for this specific rod—fish-fighting or casting accuracy—and aligns the blank accordingly.

You will note that we discussed locating the effective spine either directly on top of the blank or exactly 180° around the blank on the underside. These are the only two positions to consider. Any other positions will make the blank dynamically unstable for *both* casting accuracy and fish-fighting ability.

People sometimes confuse the effective spine with strength, and erroneously assume that the side with the effective spine is somehow stronger. This is not true. A rod held with the effective spine on the bottom or the top will have identical lifting strength.

We said the rod builder has a choice and determines whether to set up the rod primarily for fish-fighting or casting accuracy. Each rod being built should be considered individually. Only from a broad, general viewpoint can categorical suggestions be made, as follows:

Type of Rod	*Effective Spine*
boat & trolling	top
saltwater spin	top
saltwater fly	top
freshwater spin	underside
freshwater fly	underside
baitcasting	top

You may question aligning the blank of a baitcasting rod so that the effective spine is on top, the position favoring fish-fighting over casting accuracy. Certainly casting accuracy is very important in bass fishing, for example. However, the casts are for the most part of moderate distance and the rod blank comparatively short and stiff. The torsional forces, therefore, have less effect than on a larger rod and longer casts. To me, the clincher is that during a day's fishing the angler using a baitcasting rod will move it through many different planes—overhead, to the left side, the right side, with reel plates up and to the side, etc. It doesn't matter where we might locate the effective spine, he would be casting with it on the underside for only a part of the time. On the other hand, when he gets a fish, he hates like the dickens to have the twist causing the guides to fall to one side or the other. If we place the effective spine on top, the rod will be stable when he hooks up with a fish.

FERRULES

For the sake of portability and practicability, the greater percentage of our rods are two-piece. While cars have gotten smaller, the trend in many types of rods, thanks to graphite, has been to longer models. So it seems safe to assume that ferrules will be increasingly with us in the foreseeable future.

Although there will always be a place for metal ferrules, most of the connections joining two rod sections are today made of the same material as the blank—graphite or fiberglass. As common as this type of ferrule has become, I'm surprised at the number of fishermen who do not know how to properly assemble or disassemble these rods.

A glass-to-glass or graphite-to-graphite ferrule has one or both parts tapered. A good example is the frequently seen tip-over-butt configuration first introduced many years ago by Fenwick. The top of the butt section is tapered and over it fits the tapered bottom of the tip section. What holds the tip section on is a friction lock at the point where the one taper jams into the other. No friction occurs until that point is reached; then within a very tiny amount of travel, the lock takes place. This requires a different technique for joining and disassembling the ferrules than the method historically used for metal ferrules.

On all glass-to-glass or graphite-to-graphite ferrules, the male and female sections should be brought together misaligned by about 90°. Then, as you feel the friction of the parts coming in contact, turn the hands to bring the parts into alignment. You really use a combination of twisting and pushing to join the rod sections together. This twisting force is very important to forming the friction lock of the tapered ferrule. Without it—simply pushing the sections straight together—there is a good chance you may throw the tip section off while casting. More important, without a tight twist lock you leave a tiny amount of space, or play, in a joined ferrule which will accelerate wear and increase chances of breakage.

To disassemble one of these ferrules, simply reverse the process. As you pull the sections apart, twist or rotate them. One minute they'll be tight, then in the next instant they will be free.

Metal ferrules, on the other hand, are always aligned exactly before they are joined. A straight pushing force is then used to join them. Friction is cumulative as more and more of the male ferrule is inserted into the tube forming the female ferrule. Therefore, for a good secure bond sufficient to distribute the casting load across the ferrules, the two sections should be fully seated. Disassembly is a straight pulling apart of the two sections.

Never twist a metal ferrule in joining or disassembling it. This weakens the glue bond between the ferrule and the blank and/or places a torsional force on the blank which the blank was not meant to withstand. Keep in mind, that metal ferrules will most often be found on older rods made before modern epoxy glues and resins were available.

All kinds of ferrules need a bit of care to assure ther continued trouble-free operation. Most important is cleanliness. Male ferrules should be periodically wiped clean, but dirt will often go undetected inside the female portion. An excellent cleaning tool is a pipe cleaner or a Q-Tip. Do not use greasy or oily lubricants. They merely attract and retain dirt which subsequently causes wear. The best thing I know of is Pro-Tec. This has a solvent-based chemistry which quickly evaporates, leaving behind a space-age lubricant. It eliminates wear, seals, prevents sticking, and lubricates.

MODIFYING THE BLANK

Despite the large variety of blanks available, it will not always be possible to locate exactly the perfect one to fit either the fishing situation or the desires of the angler.

However, the knowledgeable custom rod builder is able to modify or alter an available blank. This skill is certainly at the very heart of custom rod work.

One method of changing the performance characteristics of a blank is by trimming it from the butt, the tip, or both ends. In fact, this technique is often used by blank and rod manufacturers. To make two different rods, they may actually trim one blank, or accomplish the same thing by merely shortening the same pattern used on the same mandrel.

Let's first examine what happens when the rod builder removes some of the tip of a blank. Regardless of the amount removed, the blank will always become stiffer. The effect is that the blank will no longer cast as light a lure weight or line as it did originally. Depending upon the strength of the butt section, it may also handle a heavier lure weight. However, if the butt section is not strong enough the maximum weight will remain the same, but the minimum will increase. For example, a blank that originally handled ½ to 1 ounce may, after trimming the tip, handle ¾ ounce to 1¼ ounces. However, if the butt is not strong enough, removal of the same length from the tip may result in a blank that will cast ¾ to only 1 ounce.

The amount or length removed from the tip obviously determines the degree of the effect. On a straight taper, the stiffening is fairly proportional. The removal of each inch from the tip will make the blank that much more stiff in an even geometric progression. On the other hand, trimming a compound taper may produce rather sudden and dramatic changes. Regardless of the taper it is best to remove only small increments at a time, and to test the blank by casting with guides temporarily attached. Careful notes will enable you to know in the future just what the effects will be on the action of that particular blank. They will also be an aid if you ever decide to trim similar blanks.

The rather sudden changes in action occurring when trimming compound tapers result from the rapid changes in wall thickness over a short area. In an extra-fast-action blank we have, in effect, a stiff blank except for the very tip, which has thinner walls and is comparatively limber. If half of the limber section is removed, it could be comparable to cutting off a much longer length from a straight taper. If the amount trimmed comprises *all* of the limber section, we are left with an entirely different blank—one which is stiff over its entire length. Its use as a casting instrument will change tremendously.

When you are contemplating cutting back the tip of a compound-tapered blank, it is best to locate the "drop" as previously mentioned. If you cannot be certain from feeling along the blank, use a calipers or micrometer and measure at 1-inch intervals. Record each measurement so you can determine at just what point the taper of the tip changes. While exact measurements would only be needed of the tip section itself, it is a good practice to feel the entire blank for the location of other "drops." When you have an understanding of the entire taper you will be better able to predict the results of any trimming.

Thanks to the excellence of today's factory-installed ferrules, most custom rod builders now work with these two-piece blanks. They are a tremendous improvement over the ferrules available only a few years ago. Additionally, the designers of quality blanks take into account the small resistance of the finest ferrules and, by small adjustments in taper, attain a blank which is remarkably similar to the feel of a comparable one-piece rod. When you are trimming a factory-ferruled blank you must remember that there is a certain amount of resistance to bending at the ferrule, and that this can be used creatively by the custom builder. When only the tip is cut back, the location of the ferrule is moved toward the tip. The stiffening of the rod is thus the combined total of that from removal of tip material, plus advancing the ferrule resistance closer to the tip. When only the butt is trimmed, the opposite is true. The position of the ferrule is moved closer to the hand and there results a proportionately longer, more limber tip section.

Let's turn our attention now to the other effects of trimming the butt. The first thing to keep in mind is that no matter how much of the butt is cut off, it will not lower the ideal lure-weight range. Varying amounts of stiffness will be removed from the butt of the rod, but the range of lure weights or fly-line weights is a function of the tip section—so they will remain essentially unchanged.

The removal of butt material will slow the action of the rod if no trimming is done to the tip. Simple arithmetic illustrates this. If we start with an extra-fast 8-foot fly-rod blank, the top 25%, or top 2 feet, does most of the bending. Cut 1 foot from the butt and the bending occurs over the same 2 feet of the tip section. However, the 2 feet are now 29% of the resultant 7-foot rod. This is an action midway between extra-fast (25%) and fast (33%).

The example is for illustrative purposes only. To work out exactly the blank would have to be one-piece and with a straight taper its entire length. If it were factory-ferruled, the final action would be somewhat slower, since the resistance of the ferrule was lowered along the blank. If it were a compound taper, the action might be slowed more *or* less depending upon the pattern used to make the blank.

Again we encounter the predictability of trimming a blank, this time from the butt. The same general guidelines can be applied, but to the effect on *action,* not lure-weight range. On a straight taper the effect on action will be fairly proportional to the amount of material removed. On a compound taper it will depend upon where the "drops" are located. For example, a blank built with a reinforced lower butt section will change considerably when the butt is trimmed. As in cutting back the tip, if too much is removed for the design of the blank, its casting characteristics cannot only be altered drastically, but it can be rendered useless as a casting instrument. The rule in trimming, then, is to first evaluate the blank carefully, think through the probable results, and remove material in small increments, checking performance along the way.

Keep in mind that we are examining techniques to alter a blank when there is not a "stock" blank available to meet our specific needs. We are not advocating trimming all blanks, or even suggesting that many of the blanks with which we work need to be trimmed. It is comparable to surgery in the practice of medicine and, in similar fashion, is used only when other techniques will not effect a cure.

Some of the more common uses for cutting back certain blanks include the following situations. Surf-fishing conditions vary greatly along our coasts, sometimes within rather short distances. In some areas tidal flow and currents are moderate and less sinker weight is needed to hold bottom. In other areas, quite heavy sinkers must be used. Similarly, the weight of the bait required can vary greatly. Or, one fisherman prefers a stiffer rod to deliver and work his artificials in the surf compared to another angler fishing the same area. When a stiffer rod, or one to handle heavier weights, is required, it is common for the custom maker of surf rods to cut back the tip of fairly straight-tapered blanks. These blanks have long been very popular on the Northeast Coast. The bulk of sales to this part of the country is made up primarily of only three models. Each is essentially a straight-taper design, and all are 11½ feet in length. However, the different rods built from these few blanks are amazing. Lengths range from 9 feet to 11½ feet, and most, but not all, of the trimming is done from the tip.

There is a school of freshwater anglers who use a technique of relatively high-speed trolling for locating the fish. Once fish are located, they switch to casting with spinning or plug-casting rods. Trolling at high speed requires a stiff rod, preferably fairly short. Some of the best tools for this purpose are made by cutting back the tip of compound-tapered casting blanks designed for heavy lure weights. Other rod builders start with IGFA trolling blanks and trim the butts.

Some muskie fishermen, as well as certain saltwater anglers, cast large whole baits.

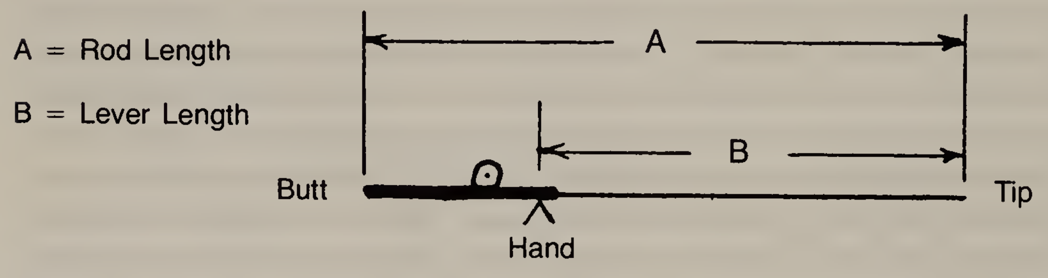
The stiff rod needed for this kind of casting is frequently built by cutting back the tip of a blank with a strong butt section. The popularity of revolving-spool casting tackle has spread from freshwater bassing to saltwater in many areas. Longer rods are preferred than those used in fresh water, and they are crafted by trimming the butts of saltwater blanks.

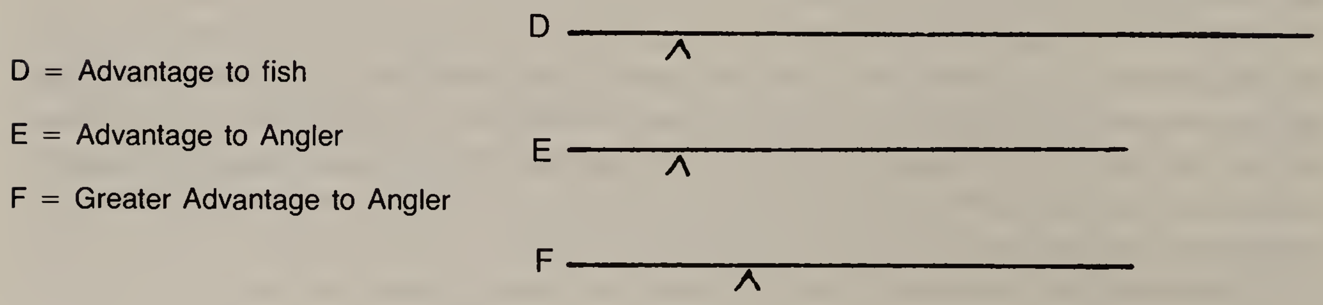
Custom builders of fly rods sometimes select a factory-ferruled blank of moderate to fast action in a length longer than the rod to be built. They then remove the desired length from the butt. The finished rod is of slightly slower action and has a different feel in hand because of the comparatively longer tip section. Incidentally, this technique of building rods with tip sections longer than the butt sections has been in use for many years. Over sixty years ago split-cane casting rods were customarily made with the tip half again as long as the butt, and three-piece fly rods had a butt shorter than the mid or tip sections.

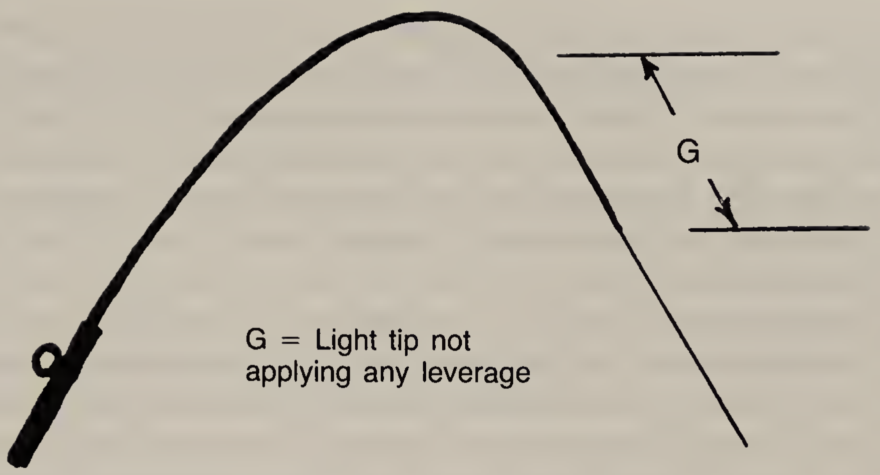
In recent years factory rods have almost all been center-ferruled. One of the main reasons has been concern over breakage of a longer tip section in transit and storage, not while fishing. If you or your customer share this concern, but prefer a rod with a longer tip, you can solve the problem by building a traveling extension for the butt. This can be of any material, such as wood dowel, or a piece from an old rod or blank. Size the diameter at one end so it fits the ferrule on the butt section, and make it long enough so when combined with the butt section it is equal in length to the tip section. When the rod is taken apart after fishing, the butt section and extension are placed together in one pocket of the rod bag. The tip section, in the other rod bag pocket, is then protected over its entire length.

Another form of blank modification is to change the leverage. It is pretty well confined to saltwater boat and trolling rods used to fight large fish from a standing position rather than a fighting chair. This stand-up fishing started in southern California, where it has produced tuna up to 388 pounds. Today it can be found all over the world.

The principle is easy to understand. A fishing rod is really a lever. The longer the rod, the more the leverage favors the fish; and the shorter the rod, the more the advantage passes to the angler. The length of the lever, here, is measured from the foregrip, the fulcrum where the angler holds the rod, to the tip. Putting it another way, an angler with a short rod will apply more pressure on the fish than he will with a long rod—even though he applies the *same* pressure (upward) at the grip on both rods. On the other side of the coin, a fish exerting a fixed amount of pull will apply more pressure on an angler with a long rod than on an angler with a short rod.







The fishing rod as a lever for fighting a fish.

Perhaps more than any other type of rod, the stand-up fighting rod is fitted to the individual who will fish it. The objective is to produce a sporting rod that gives the angler and the fish an equal chance. A big, strong fisherman can handle a longer rod, while a smaller, less muscled fisherman needs a shorter rod. Fitting takes the form of having the angler hold the blank *as he would in fighting a fish.* The rod maker then pushes down quite heavily on the tip—and each person observes what happens. If the angler is physically pulled off balance, or if his heels lift involuntarily from the floor, the blank will have to be shortened from the butt. The blanks, incidentally, are extremely strong and thick-walled through the butt and the mid-sections. Fitting continues, and the blank is shortened bit by bit from the butt until the leverage and power comfortably match the fisherman. We will discuss construction of the rod in the chapter on handle assemblies.

Modifying effects of guides

There are a number of techniques for modifying the action that involve the guides. Since they are all interrelated, we will first list the factors, then discuss the general effects upon action of each, and finally examine how they can be used in various combinations to achieve a desired result. They are:

1. The weight of the guides and tip-top
2. The resistance to bending the guide imparts to the blank
3. The length of the guide feet
4. The length of the wraps holding the guides

It is important to note first that the lighter the blank being used, the more pronounced will be the effect of each of the above. If an ultralight rod is being built, each of these variables can materially alter the action. On the other hand, a saltwater blank for heavy lure weights will be considerably less affected by each variable.

The weight of the guides and tip-top. The basic effect here is that the heavier the guides and tip-top, the more the action of the blank will be slowed. If you find the action of a certain blank too fast, use heavier guides and tip-top to slow it down. Depending upon the length of the rod, you might even consider adding one or two more guides than usual in order to add more weight. If you do so, add them at the tip end of the rod where they will have the most effect. In unusual situations a rod builder could even use an oversize or heavier tip-top to slow the action. Care must be exercised, however, or the rod can be made sluggish and unresponsive.

On the other side of the guide-weight coin, the lighter the guides and tip-top, the more responsive the rod will be. During the cast it will have a more rapid rate of recoil. So to keep the action of a blank as responsive and fast as possible, use the lightest guides, and especially the lightest tip-top available. To further reduce weight, use as few guides as you can to adequately distribute the stress along the blank. Also, use a thin coating of wrapping finish that is light in weight, since a thick, heavy finish adds a surprising amount of weight to a light rod.

The remaining three of the above four factors deal primarily with adding *stiffness* to the blank. As we all know, the guides are placed progressively closer together toward the tip of the rod to distribute stress properly over the increasingly lighter and more limber tip. Thus, most of the guides will be on the top one-third of the blank—and that is the section that does most of the bending in casting. The effect of the following three factors will, then, be primarily on the tip section.

The resistance to bending which the guide imparts to the blank. A single-foot guide offers the least resistance to the bending or flexing of the blank. The finished rod will flex most like the bare blank. By contrast, a guide of high resistance, such as a rigid type of two-footed guide, will add stiffness to the tip section of the blank. Try to keep the weight factor out of your mind as you visualize this effect. You must compare guides of equal weight. As stiffness is added to the blank, particularly at the tip, the rod will assume a different configuration, or shape, in casting the same weight.

The length of the guide feet. Guides are wrapped tightly in place and the feet are held securely against the blank. In effect, each guide is like a splint at that point of the rod. The longer the feet of the particular guide used, the greater the length of the blank that is restricted from freely bending. If we want to reduce the stiffening effect we would use guides with the shortest possible feet, or grind the feet shorter. On the other hand, if we wanted to add stiffness to the blank, we would choose guides with longer feet.

The length of the wraps holding the guides. When a hollow blank flexes it does not stay perfectly round. There is tension across the top of the bent section and compression on the bottom. The blank assumes a slightly oval configuration when it is fully loaded. If a thread wrap is made along a section of the blank, then covered with wrapping finish, it has practically the same effect as adding to the wall thickness of the blank. As we have seen earlier, the thickness of the wall at any given point determines its stiffness at that point, and therefore the overall action. The thread wrap, by adding considerable hoop strength to the blank, helps keep it from becoming oval—thus stiffening it. The longer the wrap beyond the end of the guide feet, the more stiffness will be added. The shorter the wrap, the less stiff and more free-flexing will be the rod.

Using guides to stiffen action

Since the last three factors just listed affect the stiffening of the blank, primarily the tip section, let's examine just how they can be used to modify the action. We would add *maximum stiffness* if we used (1) the lightest possible guides, (2) guides of the most rigid two-foot construction, (3) guides with the longest available guide feet, and (4) considerably longer guide wraps than needed just to hold the guides in place. This is a more or less theoretical situation, since it would be difficult to locate a type of guide that would both be as light as possible, yet be constructed of rigid two-foot construction and have extra-long feet. We will rarely be able to combine all four factors for their maximum effect.

Nevertheless, we could stiffen a light rod considerably—if that was our objective—by applying the principle of each to the extent possible. For example, on a light spinning rod we would use the Fuji BSHG guides and make the wraps just as long as possible without destroying the appearance of the finished rod.

While we are exploring the methods of making a rod more stiff, let's examine an actual creative example. I know of a custom rod builder who builds unique fly rods on compound-tapered fast-action blanks. He likes all aspects of the blanks except the tip-oriented action. So what he does is take a blank designed for a certain weight fly line and add more than the usual number of light-weight snake guides with the longest feet he can find. The extra guides are added on the tip section. The length of his wraps, instead of being proportionate to the size of each guide, *increases* toward the tip. The guides near the tip have the longest wraps, while those at the butt end have the shortest wraps. What he has done is to restructure the action of the fast-tip blank. No longer is the action confined primarily to the tip. His objective is to spread out and shift the flexing lower on the rod, and to have the last 1 or 2 feet next to the tip-top remain comparatively stiff. To achieve this action it is generally necessary to use a fly line one size heavier on his rods. He plans for this by simply starting with a blank designated for one size lighter line than is to be cast with the finished rod. If he is building a rod for a 6-weight line, he uses a blank designated for a 5-weight line. He, and his customers, maintain that there is considerably less tip vibration at the end of the cast, and that line shoots more easily. He compares the stiffer tip section to a rifle barrel through which the line is shot with greater accuracy and distance. Probably not all fly fishermen would agree, but for those whose styles of casting it fits, the action is a great improvement over available factory rods.

It might be helpful here to examine the development of this same builder's rods when one of the factors we have been discussing is changed. For quite a time after the Fuji single-foot fly guide first came on the market, he had no interest in it because it did not offer the resistance he desired on his rods. As the advantages of this guide were discovered by custom builders and fishermen, he turned his attention to it, attempting to see if somehow it could be worked into his technique. Since his rods never had a traditional appearance, he was not limited in his approach. As of this writing, he has found that on light blanks for lightweight lines, he can utilize the single-foot guide if he makes his wraps the same length as he did with snake guides, but as one long single wrap instead of two individual wraps. He therefore wraps these guides up over the guide foot and, rather than end the wrap at the guide ring, continues wrapping over the blank alone for an equal distance. He only has one guide foot instead of two for resistance on the blank, but this has largely been offset by (1) the length of the single, solid wrap, (2) the fact that snake guides were certainly not the most rigid guides in the first place, and (3) the better shooting qualities of the O-shape of the Fuji guide and its lower coefficient of friction versus the U-shape of the snake guide. This craftsman understands the factors that affect rod action and uses them creatively.

Let's take another case of stiffening the tip section, but one where it is desired to move more of the bending even lower on the blank, to the middle of the butt section. This type of action is desired by a certain few anglers on spinning and fly rods. For this purpose it would be best to select a blank of fairly straight taper with a tip size of medium to slightly larger diameter. Stiffness could again be given the tip by using available combinations of long wraps and fairly rigid guides. However, here we want to add slightly more weight to the tip section to slow its rate of recoil and force the bending lower on the blank. Thus, for the blank selected, we would use a bit more guide weight on the tip section. When casting the finished rod we will find that to a certain degree we are casting the weight of the tip section itself. This often enables this combination to handle lure or fly-line weights a fraction lower than that for which the blank is designated, and can be useful for that purpose alone.

A word of caution about developing this type of action in a rod. If you carry it too far by adding too much weight on the tip section while proportionately stiffening it, a "hinge" type of action will result. This occurs when practically all of the bending is forced into a small area along the lower part of the blank. This point on the blank acts much like the hinge on a door. Needless to say, it then becomes a poor casting instrument. Too much stress is also being confined to a small area of the blank, and that section will "soften" or grow weaker with use.

Using guides to soften action

We have been discussing the application of our four factors relating to guides for the purpose of stiffening the blank. Let's now look on the other side of the ledger and see how they might be applied to make a blank more flexible. If we found the blank with which we were working to be stiffer than desired, we could make it flex more and slow the action by (1) using heavy guides and tip-top, (2) selecting guides that offered the least resistance to bending, (3) grinding the guide as short as practical, and (4) using short wraps. Here again we are faced with a situation where we are dealing with the theoretical maximum effect, since most heavy guides are quite rigid in construction while the guides that offer the least resistance to bending are also light.

We would have to evaluate the blank and make a compromise on the weight and rigidity factors, then use each of the other factors to maximum advantage. On a very light blank we might gain sufficient weight with the SP series of Foulproof guides, their heaviest series for this purpose. The feet could be ground just a bit shorter and the guide wraps kept short. We definitely would use a heavier tip-top than the Foulproof model. If we preferred aluminum-oxide ceramic guides, we could go to the heavier American-made wire-frame ceramics. These are certainly not the only possibilities for guides, just illustrations. The objective would be to add as much weight as needed for the blank, and the desired slower action, without using a very restrictive guide.

In order to keep the foregoing discussion in proper perspective, remember these are techniques for using guides to *modify* or change the action of a given blank. This is a change away from the normal action that was built into the blank by the manufacturer. I do not mean to imply that such modification or change is necessary or even desirable. The best solution to building a rod with a certain action is to build it on a blank which already possesses that action. Guides can then be selected and wrapped on a more normal basis to complement the blank.

If a custom rod builder understands the principles involved in using guides and length of wraps, he can tune the action of a blank to his desires, or those of his customer. Initially it will require some experimenting. The effect of guide weight alone can be roughly determined by taping the guides and tip-top to the blank. This is best done after the handle is completed, since the feel of the smaller-diameter bare blank in the hand can be deceiving. For a more precise evaluation, the guides would have to be wrapped on and left unfinished for the testing. To develop skill in predicting results beforehand, it is suggested that you first think the problem through and make a note of your estimate of the effect. Then, after running your test, record the results. If you were off your mark, again estimate the corrective steps, run your tests, and record them. These notes will be of great help in the future and you will master the process much more quickly.

COUNTERBALANCING

Counterbalancing is not a technique for actually modifying the action of a blank, but it will change the feel of the rod in the caster's hand. Counterbalancing is the addition of weight at the extreme butt end of the rod in order to shift rearward the point where the rod could be balanced on a fulcrum. Most spinning and fly rods, other than the shorter ultralights, will feel slightly tip-heavy in the hand even with the reel mounted. Many anglers maintain that just a bit of tip weight is a desirable help in casting, since it adds an element of feel and promotes better timing. On some rods, however, the tip weight is too heavy and will tire the top of the caster's wrist in a long period of fishing. It is not the total weight of rod and reel that tires a fisherman—rather it is the imbalance of too heavy a tip that exerts a pull on the forward cast and especially during the retrieve. This type of rod should be counterbalanced.

Many fishermen have a preference for a certain balance in a rod. A person casts best and enjoys his fishing most when a rod possesses the perfect balance *for him.* Except by pure chance, he will not find this balance in a factory rod. The custom rod maker can build any balance into a rod to exactly fit the desires of the person who will fish it. This is just another one of the many examples of why a custom-built rod is superior.

We should note here that on fly rods, while an angler may definitely have a preference for where the balance point is located, this is generally interpreted by him to be the balance when he is simply holding the rod with reel mounted. In actual fishing, the balance point shifts. This is due to, and dependent upon, the amount of fly line that is out beyond the tip-top of the rod. Fly line has weight. After all, that is what is being cast. When a long length of weight-forward line is past the guides, that weight has been *subtracted* from the reel weight and *added* to the tip weight.

My own experience has been that on fly rods, where the reel is located below or behind the hand on the grip, balance does appear to affect the apparent action of the rod. A rod that is heavy in the butt, and this includes the weight of the reel used, will have a slightly slower action because of the pendulum effect of the weight behind the hand. A rod with the balance point farther up on the rod will appear to liven up the rod's response.

Small pieces of any heavy material can be glued inside the very butt of the blank. For years many of us used bits of lead, slugs from shooting ranges, etc. Then RodCrafter Dave Hartranft introduced us to the perfect material, Shape-A-Wate. This is a moldable putty consisting of 90% lead. It is made for adding small amounts of weight to lures and flies, and is, incidentally, ideal for this purpose.

To counterbalance a rod, fit, but do not glue, the butt cap, butt plate, or closed-end fly-reel seat to the handle assembly until after all other work on the rod, including the finishing of the wraps, has been completed. Mount the reel to be used. Pinch off what you estimate to be the correct amount of Shape-A-Wate and lay it along the top of the butt end. Now, check the balance. If the tip feels too light, remove some of the Shape-A-Wate. If the tip is still too heavy, add another piece. Don't worry about accumulating small pieces of the lead putty. It never gets hard and can be rejoined just like modeling clay. When you have the right amount of weight, roll it into a tube or ball slightly larger than the inside diameter of the blank butt. Place some epoxy glue well up inside the blank, push in the Shape-A-Wate, and glue on the butt cap. Set the rod vertically overnight. The epoxy will run down the inside of the blank, forming a seal to hold the putty in place permanently.

COMPACT PACK ROD

There are a number of pack-rod blanks already ferruled. However, most all of these consist of rod sections from 18 to 22 inches in length. These are fine for attaching outside a pack, but many backpackers prefer a rod made of shorter sections. RodCrafter F. Yates Borden designed a 6-foot fly rod that meets these requirements and handles a 6 or 7 weight line. It is a lightweight rod with surprisingly good action considering the five ferrules needed. It is designed for the small fish which the backpacker normally encounters. The construction techniques have numerous applications in developing any lightweight sectional rod, and should be a part of the custom rod builder's "bag of tricks."

Dr. Borden constructed his original rod from two identical two-piece 6-foot fly rod blanks, utilizing the existing factory ferrule. However, it is easier and more economical to work with identical one-piece blanks. A straight taper and medium to slow action are preferable for a multi-ferruled rod of this type.

Select which will be the rod blank and the ferrule blank. On the rod blank, mark the spine from the tip at 6 inches, 18 inches, 30 inches, 42 inches, 54 inches, and 66 inches. Use masking tape and make a permanent mark on the tape. This must be done at this time since the spine cannot be determined once the sections are cut. The marks must withstand handling until the guides are positioned near the end of the construction.

Still working with the blank selected for the rod, cut it into sections. In order to have each finished section the same length, including ferrule, proceed from the tip and cut the first section 12¾ inches long. Each of the succeeding sections should be 11¾ inches long. You will end up with a "waste piece" ½ inch long at the butt end of the blank (See Fig. 1). Sand the carefully cut surfaces square and smooth. This must be done before gluing the ferrules in place.

Turn now to the other blank from which the ferrules will be constructed. Five internal, or inside-fitting ferrules must be made. They will each consist of a section of the hollow fiberglass blank. For a normal, heavier rod these would be considered rather fragile ferrules. However, for the ultra light pack rod designed for small fish they will prove equal to the task. Additionally they will help preserve the action.

Each ferrule will be approximately 2 inches in length; 1 inch will be glued inside the blank and the other inch will project from the rod section forming the internal ferrule. Starting with the tip section of the rod blank, insert the tip section of the ferrule blank. Insert until the fit is quite snug. Mark the point on the ferrule blank where it emerges from inside the rod blank (See Fig. 2).

Remove the ferrule blank from inside the rod blank. Measure 1 inch in each direction from the previously made mark, and cut the ferrule blank at these second marks for a 2 inch ferrule. Using sandpaper, gently round just the very edge of each end of the resulting ferrule. This internal ferrule will have a mark in the center which will be of importance in the subsequent gluing. Proceed down the rod blank in exactly the same manner in order to form the other four ferrules. On the last ferrule you might want to make it a bit longer—say 4 inches—for added reinforcement. In that case, two inches would then be glued into the butt section.

One half of each ferrule will be glued into the lower section of the rod blank. A plug will project out the end which will provide a detachable joint inside the tip-most section of the finished rod. To glue each ferrule in place, *lightly* sand the finish on the half *below* the

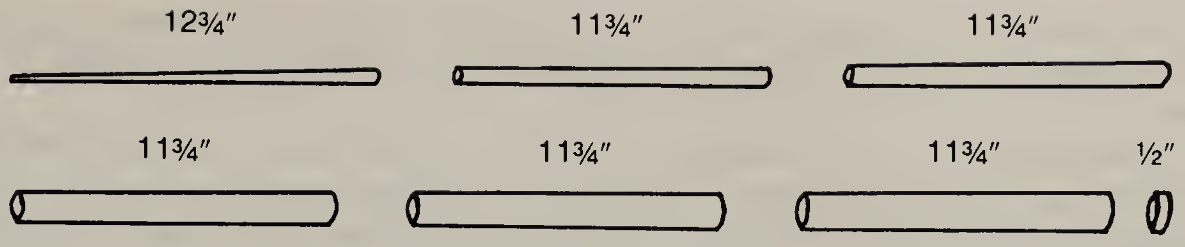


Fig. 1

Rod blank cut into sections. Lengths are shown, plus ½" waste.

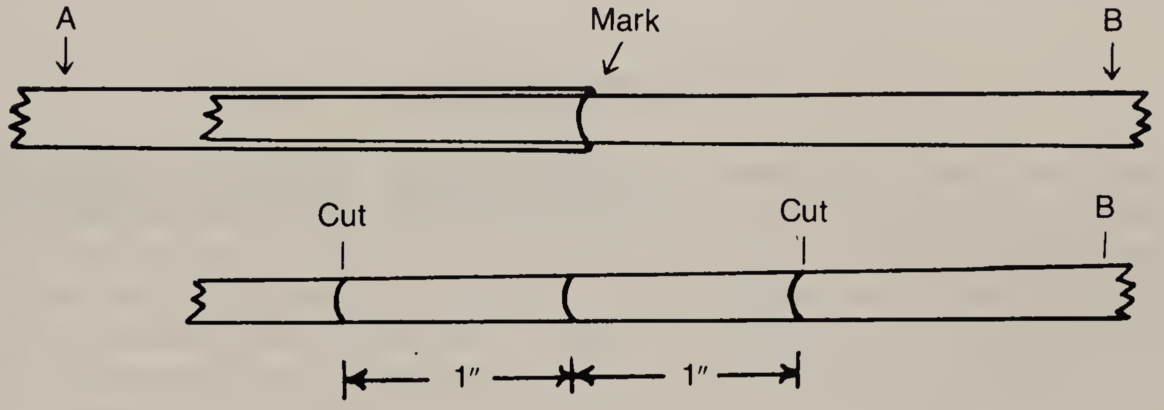


Fig. 2

Making ferrule: Insert female blank (B) into rod blank (A) for snug fit. Mark where ferrule blank emerges. Measure 1" on each side of mark and cut.

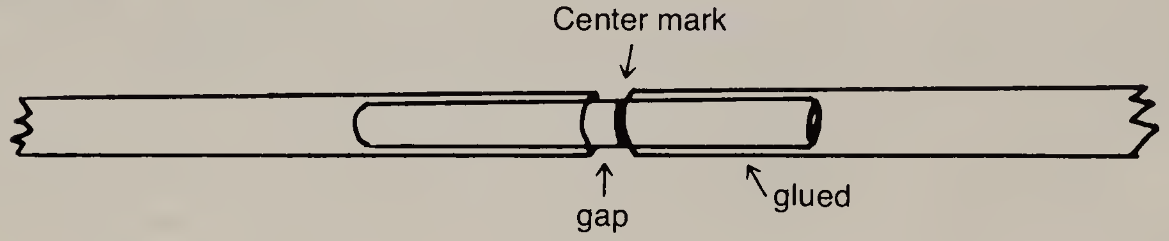


Fig. 3

Ferrule construction. Ferrule is glued into lower section of rod blank. Gap of 1/16" to 1/8" is made by filing bottom of tip section of rod blank.

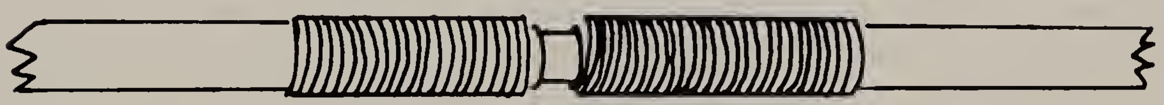


Fig. 4

Ferrule wrapped with size "A" thread for reinforcement.

previously made center mark. This will provide a stronger glue bond. *Do not sand the upper half of the ferrule* since that will destroy the fit.

Smear a light coat of epoxy on the lower half of the ferrule. Also coat a bit more than one inch of the inside of the upper end of the rod section. Insert the ferrule from the *opposite* end (the larger end) of the rod section. Using an old piece of blank, wood dowel, or steel rod, push the ferrule up inside the rod section until it emerges from the upper end. Rotate the ferrule to spread the glue and carefully align your center mark on the ferrule at the point where it just emerges from inside the blank (See Fig. 3). Dampen a rag with epoxy thinner and carefully remove all glue from the projecting plug portion of the ferrule.

After the epoxy has cured, check each ferrule for a good snug fit. You may find that some joints are too loose. To tighten a joint, file a bit off the female (tip) section of the rod blank. A small gap (1/16 to 1/8 inch) should exist between rod sections to allow for future wear. Apply a wrap over both tip and butt sections of each ferrule joint for reinforcement. If you want the tip section of the rod exactly the same length as the others, cut off about 1/4 inch before mounting the tip-top. Proceed with building the rod as you would with any blank.

CUTTING BLANKS

There are various rod-building processes that require cutting or trimming blanks. Obviously, we want a clean, straight cut with no splinters. Let's examine some of the methods that can be used. A fine-tooth saw such as an X-Acto miter saw works quite well. There is even a small matching miter box available. Of course, you can make your own from wood or a length of aluminum I-beam. A 32-tooth (per inch) hack saw can also be used, particularly on heavier blanks. It is recommended that you first wrap the blank with a piece of masking tape to prevent splintering. Some people find it easiest to make the cut through one wall, then rotate the blank as they progressively cut through the wall around the blank. On lighter blanks, or small diameters, a jeweler's saw or fine-tooth coping saw can be used in the same manner.

Regardless of the cutting tool used, the cut should be squared with a file. Use a flat bastard file. You will find that coarse works better than fine. Depending on the purpose for the cut, it is also a good idea to lightly round the edge with sandpaper.

TWO

Glues and Gluing

The single most important ingredient of a well-made custom rod is not any of the components, but the manner in which the rod is assembled. While this is not a book on fishing, allow me to illustrate with a personal story.

A good many years ago I built a two-handed spinning rod, the cosmetics of which particularly pleased me. Each of the cork grips was inlaid with a ½-inch walnut trim ring faced with a pair of 1/16-inch white plastic rings. The brown-and-white theme was repeated in the wraps on the gold blank. When ceramic guides first appeared, I rewrapped the rod and outdid myself on the decorative butt wrap in preparation for a fishing trip.

The trip was to the Caribbean coast of the Yucatán Peninsula in Mexico. While there, we discovered the sailfishing was hitting its seasonal peak in the channel between the island of Cozumel and the mainland.

We decided to give it a try, and it was understood that I would try casting to my share of any fish we teased within range. I was excited about the prospects and hoped to give my refurbished spinning rod a workout.

As we were told, the fish were there, and finally after a number of unsuccessful attempts, I did get a hookup. The battle started with those breathtaking leaps and tailwalks for which sails are noted. The carefully set drag on my reel was working smoothly, and I was in my glory. What could be better—a beautiful fish and a beautiful custom rod of my own craftsmanship. While the finish was still some time away, I could already visualize a color photo of the fish and me with my rod.

A few minutes later my ego received a jolt. The cork foregrip so lovingly glued in place had come loose, and now rotated on the blank. It just couldn't happen, but it had. I slid my right hand onto the blank just above the foregrip. Not nearly as good a handhold, small and slippery, but it would have to do.

The jumps were now less frequent, and the fish and I were settling into a give-and-take battle. He'd run while I stood at the stern with the rod in a full brace. Then I would slowly pump him toward me and gain back the line a few feet at a time. Without a usable foregrip it was a bit uncomfortable, but I was still in command, albeit with bruised pride.

I shouldn't have worried about the foregrip, because that was nothing compared to what happened next. The glue joint between the cork reel-seat bushings and the blank gave way. Now I was in definite trouble. My spinning reel was a moderate-sized saltwater model with a long handle. Every time I tried to turn the handle against the pressure of the fish, the whole reel seat rotated. On the down stroke of the handle the reel would swing to the right of the rod. On the up stroke the reel would ride up on the left side of the rod. It was almost impossible to gain line.

Now, I'm a stubborn cuss, and I wasn't about to give up, especially since the problem was of my own doing. If I had been using the charter boat's equipment it would have been easy to become quite indignant, throw in the towel, and blame the captain for faulty equipment. But *I made the rod*—the one everyone had admired when we came on board. Then I had bragged a little about the advantages of a quality custom rod. To put it mildly, my ego was smashed. If I was to have any left I would have to land the fish.

Both arms ached, and my hands were cramped to the point where I believed they would never open again. I tried wedging the long rear grip between my legs in an attempt to bring my hands closer to my body and try to offset the rotating reel seat. Fortunately, the fish never sounded, and in a much longer time than it should have taken, I finally—and luckily—landed the fish. I felt none of the glory I had envisioned earlier, just embarrassment.

For the rest of the day I was noticeably quiet while I resolved to learn a lot more about gluing components together. For the next three days my aching hands, arms, and pride served to intensify that resolve. The only good thing was that it had happened to me instead of to one of my customers.

Later when I carefully cut off the cork, I found I had used a glue which dried by evaporation, rather than catalytic action. I also found the surface of the blank had been left smooth rather than roughened for a good glue bond. It was impossible to tell, but I also may not have done a good job of fitting the cork to the blank. All of these are really inexcusable in a custom rod. They are also the most important aspects of gluing. So, with my experience in mind, let's examine carefully the all-important techniques of creating a strong, permanent glue joint.

There are many glues available, and various ones can be used in different rod-building processes. Regardless of the type, it must be waterproof, very strong, and somewhat resilient (not brittle).

SEMIPERMANENT BONDS

Years ago, metal ferrules and tip-tops were mounted with a non-permanent, thermoplastic glue called ferrule cement. The end of a stick of the cement was melted, quickly smeared on the blank, and the part slipped on. Bonding was instant but unfortunately not very strong. Although replacement was easy with the application of heat, the ferrule cement itself was frequently the cause of the repair.

Today, when metal ferrules are occasionally used, the preferred glue is epoxy. On some bamboo rods where it is advisable to be able to remove the ferrules for repair, Pliobond glue is used. It is a bit stronger than ferrule cement, yet the bond can be broken with heat.

There was a time when wire-ring tip-tops could always be counted upon to groove and need periodic replacement. With present-day ceramics, grooving is practically nonexistent. Replacement of tip-tops is largely limited to those inadvertently stepped on, caught in trunk lids, doors, etc. For this I prefer five-minute epoxy glue. This is a fairly brittle adhesive, not nearly as strong as regular curing epoxy. However, it is stronger for tip-top installation than ferrule cement. If you use it sparingly, you will later be able to break the bond with heat. For that purpose I use an electric soldering gun.

To mount a tip-top with five-minute epoxy, use only a few drops. Immediately after joining, lay the blank on a flat surface with your alignment mark facing up. Place a piece of masking tape over the blank to keep it from rolling and carefully align the tip-top. Five minutes later you can proceed with placing the guides in position.

PERMANENT BONDS

My own experience convinces me that just about every other glued assembly on a rod, except the two previously mentioned, should be permanent. The strongest glue for a permanent bond in these situations is epoxy. Again, let me point out that I am not speaking of the quick-setting epoxies—rather, those that take about two hours to set up and overnight to cure. Actually, a full cure will take thirty-six to forty-eight hours, but 90% of the strength is achieved overnight.

Epoxy glue

One of the important advantages of epoxy is that it cures by catalytic or chemical action between the two parts that are mixed, rather than by evaporation of solvents. In a tight-fitting joint, such as a reel seat, cork grip, or especially a resilient grip, air does not easily penetrate to the glue and evaporation is slowed considerably, sometimes taking days. In the case of a tight-fitting, resilient grip that was stretched over the blank, it could take months for the solvents to evaporate. Also, in gluing other rod parts, evaporative-type adhesives will frequently "skin over," i.e., first the outside dries, but the inside takes much longer to dry. During that time the parts may be moved slightly, resulting in a much weaker joint. This is one of the reasons evaporative glues require clamping. One of the problems is knowing how long the pieces being joined should remain clamped together, since the accessibility of air, temperature, and humidity all affect drying time. In rod building it is often impossible to effectively clamp components together and apply any pressure. Some examples would be joining a reel seat to cork arbors, cork grips to the blank, and a gimbal to a butt.

Many evaporative-type cements tend to crystallize over a period of time. When they do, they will no longer accept stress and the joint will fail. This is particularly true if the film of glue between the two rod components is not kept to the required minimum. Evaporation also causes the volume of the glue to shrink. Parenthetically, this is one of the reasons that clamping is recommended by the manufacturers of these glues. Clamping the parts together squeezes out excess glue and keeps the film of glue as small as possible. As noted, this is often impossible to do in rod building. Epoxy does not shrink when it solidifies, and it does not require clamping pressure. It is only necessary that the parts not be moved while the glue goes through its initial curing stage.

Epoxy glues are not all the same. In fact, there are a great many different formulations. The best for rod work are those that do not become brittle and retain a slight elasticity. Also preferred are those that are clear, since any glue line on the surface of the rod is then practically invisible.

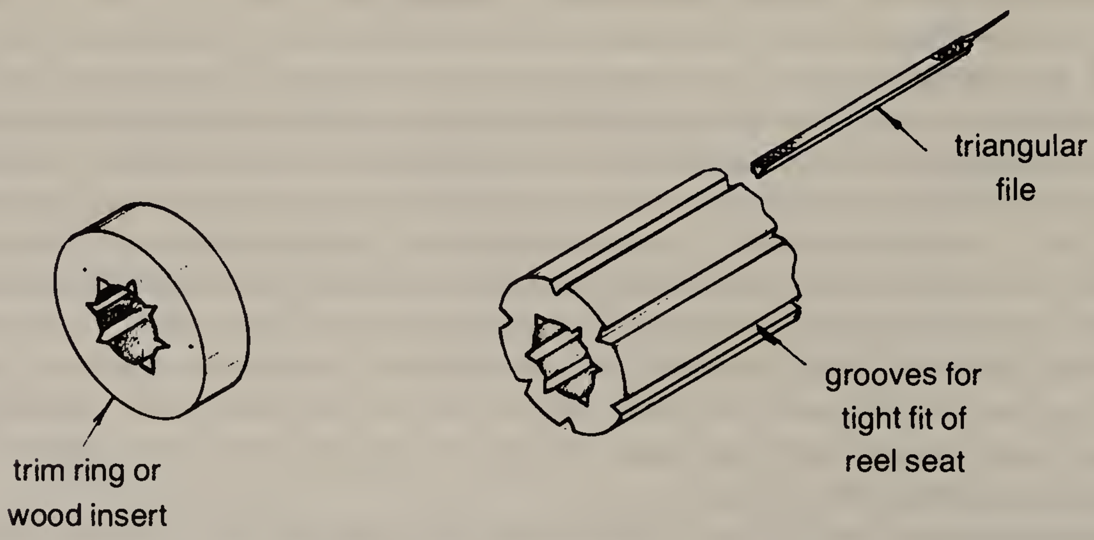
Epoxy does not bond well with rubber and certain plastics. Keep in mind that many components such as butt caps may appear to be rubber, but are actually man-made synthetics generally of butrate or polyolefin. If the surfaces of these materials are properly roughened, epoxy will bond them. For real rubber, use one of the various adhesives designed for rubber and follow directions. If, by testing a small area, you find that a certain plastic will not bond well with epoxy, use one of the special plastic cements. The situations where these special adhesives are required will be relatively few.

The most important factor in obtaining a good bond with epoxy is proper preparation of the surfaces to be joined. Always roughen both surfaces to provide a "tooth" or "toehold" for the glue. If you could view a cross section of a glued joint under great magnification, you would see that the glue fills every tiny scratch and pore in each surface. This has the effect of increasing the actual glued surface for a much stronger bond. Also, each tiny scratch filled with epoxy serves as a lock to prevent the parts from moving in any direction.

Let me inject here a word about fitting the parts to be joined. For glues other than epoxy, it is frequently recommended that a very tight fit be obtained, such as by forcing a taper-reamed grip into place on the blank. This is *not* the case when using epoxy. If the fit is too tight, much of the epoxy will be forced out of the joint. It is better to make an easy fit—one in which the grip, in the above example, could be just slid into place. The same would be true of a reel seat being fitted to slide over cork arbors. The joint should not be so loose that there is any side play, just an easy fit requiring no forcing or pressure.

As a rule of thumb, the smoother the initial surface, the more it must be roughened. In rod building we work with many smooth, highly polished surfaces. A blank is a prime example. When mounting anything on a blank, mark off the area of the blank to be covered. Use a finely pointed metal scriber, or needle, to scribe lines around the blank. Next, use coarse sandpaper to scratch that section of the blank. Cut through the factory-applied finish to just the surface of the fiberglass or graphite. Move the sandpaper both along the axis of the blank and at right angles to the axis. Also make some passes at a 45° angle in each direction. Wipe the roughened area clean using a rag dampened with alcohol.

The inside surfaces of reel seats are also extremely smooth and must be scratched and roughened. I use taper reamers made for cork work. These are sections of a blank to which coarse grit has been previously epoxied. A dowel or metal rod wrapped with very coarse sandpaper or emery cloth can also be used. In fact, any tool with a sharp cutting surface that can be inserted into a reel seat will do the job. Move the tool in and out along the axis, as well as around the circumference. Make scratches at as many different angles



Preparing wood parts for gluing.

as possible all over the inside surface of the reel seat. Again, use a solvent-dampened rag for cleaning.

The inside surfaces of gimbals and butt ferrules can be similarly roughened. Use a piece of very coarse sandpaper over your index finger to scratch the insides of all butt caps, especially those made of resilient material. A taper reamer or thin rasp works well on the inside of hosels. Remember also to roughen the end surface which will be glued to the grip.

Trim rings and reel-seat inserts of wood, either regular or impregnated, need to be scored on the inside. In addition to roughening the inside, I frequently use a small three-cornered file to make about six or eight grooves the length of the hole. When filled with epoxy, these really serve to lock the part in place. On trim rings, each side face should be scratched thoroughly with very coarse sandpaper. Make the scored lines at least at right angles to each other, but be careful not to allow any deep scratches to extend to the outside edge where they will show on the finished rod. Exactly the same treatment is given plastic trim rings.

Natural cork is porous and needs less scratching. Reel-seat arbors of composition cork and grips of burnt cork (also a compressed material) are smoother and definitely should be roughened. Regardless of the type of cork, I roughen both the inside hole and the outside surface of reel-seat arbors. I also use the small three-cornered file to make grooves on the inside the same as described for wood inserts and rings. The same file can be used to make a series of short grooves at various angles on the outside of cork arbors.

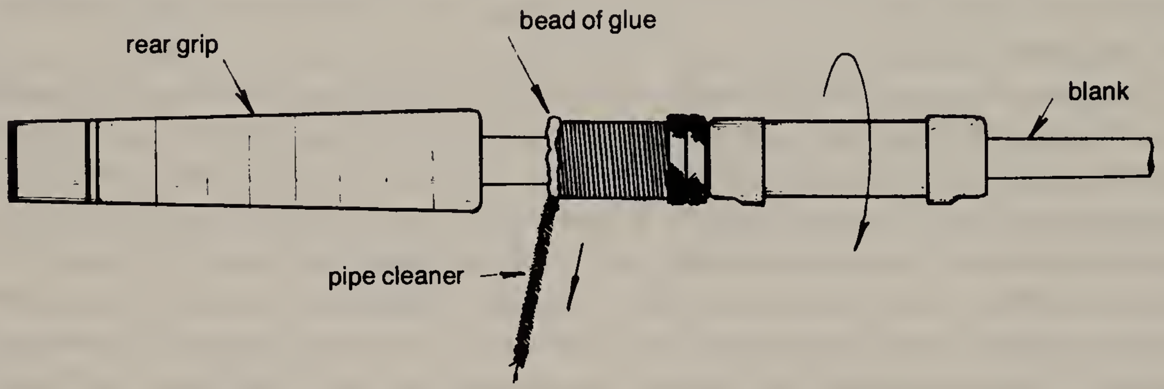
After roughening the surfaces to be joined, it is important that they be cleaned and degreased. The greatest glue in the world won't stick to dirt. I first blow dust from the surfaces, then wash them well with alcohol or acetone. It's a good idea to pay particular attention to degreasing metal saltwater reel seats. Any good solvent will do the job, just use with plenty of ventilation and avoid skin contact. I use commonly available automotive brake-drum degreaser.

Epoxy glue should be mixed of equal portions of both resin and hardener. Do not attempt to mix them in a container of any type, or on a sheet of plastic. The best mixing surface is a piece of paper laid on a hard, flat surface. It can subsequently be discarded. An excellent mixing tool is a flat popsicle stick or small spatula.

Squeeze out equal amounts of the two parts from the tubes. The hardener will usually be thicker than the resin, so care is needed to get an equal volume of each. It's best to squeeze a line of the hardener onto the paper first, since it will not spread out as rapidly as the thinner resin. Then when the resin is placed on the paper it is easier to judge an equal volume. Mix the two parts with a linear or straight motion of the stick. Scrape from the outside of the mass toward the center, and progress all the way around. Then use a circular mixing motion. Alternate between the two mixing strokes until mixing is complete. This will usually require a minimum of two minutes. The flat stick used for mixing also makes a good applicator.

Once the surfaces to be glued have been properly roughened and the glue completely mixed, it can be applied. Where possible, such as on butt caps, butt ferrules, gimbals, etc., spread a film of epoxy on *both* surfaces to be joined. The object is to completely fill all the small scratches with glue. On components that must be slid over the blanks, it is generally not practical to first coat the inside with epoxy. No matter how careful you are, you will smear some epoxy onto the surface of the blank before you get the component into the position where it will be glued. If you do not mind cleaning the blank immediately afterward with a rag moistened with alcohol, you can coat the inside of the hole with epoxy. A less messy approach is to place a fairly thick coating of glue on the fixed surface. This will be the blank itself when mounting a grip, or the arbors in the case of a reel seat. Slide the uncoated component over the blank. As it starts to come in contact with the epoxy-coated surface, push it slowly in place with a constant rotating motion. This will spread the glue into all the scratches and pores on the inside of the component being mounted.

You will notice a bulge of excess glue being pushed ahead of the component. If it builds to a size where it may drip or come back over the component being mounted, stop and use a narrow flat stick to remove the excess epoxy. Wood coffee stirrers or popsicle sticks are good for this purpose. Just before the component reaches its final position, stop and remove the excess glue in the same way. Doing so will eliminate a large amount of glue from being squeezed out as the component is finally seated. Then only a small bead of glue will exist at the glue line. This is easily removed with a rag, preferably an old towel with texture, or a pipe cleaner.



Removing bead of glue with pipe cleaner.

To remove the bead of epoxy without smearing it over adjacent surfaces, place the rag or pipe cleaner underneath the rod to serve as a pickup. Draw the pickup toward you as you rotate the rod down against the pickup. If the speed of the two movements is coordinated, the glue bead will be transferred in a line to the rag or pipe cleaner. Any small amount of glue remaining can be wiped clean with a rag moistened with epoxy thinner.

As noted previously, an epoxied joint need not be clamped. However, it is important that the parts not be moved while the initial cure takes place. Carefully set the rod aside where it will not be accidentally bumped. The glue will flow from gravity inside the joint at first, so give some thought to the position of the rod while the glue sets up. For example, a rod on which you have just glued a butt ferrule, butt cap, or gimbal should be placed vertically. This can often be best done in a corner of the shop. A few strips of masking tape will hold it to the walls.

Heat can be used to accelerate the cure of epoxy. A good source is a heat lamp or a large photo bulb in a reflector. Do not place either source too close to the rod assembly. A temperature of about 150°F. works well with most epoxies. I frequently use a No. 2 photo bulb in a 10-inch polished reflector and place it no closer than 2 feet away. About every five minutes I rotate the rod so that the opposite side is facing the heat. Initially, heat will thin the epoxy a bit, causing it to flow more easily. For this reason it is good practice to check the exterior of the joint frequently at first to see if any additional glue has flowed to the outside. If it has, use the technqiue explained earlier to remove the bead of glue. Heat is not needed during the entire curing process. Remove the heat source when the glue has set up and become firm.

It should be mentioned that all epoxy glues can be quite irritating to the skin.

Susceptibility varies among individuals, but the best course is to avoid prolonged exposure. RodCrafter John Giannini started a method of clean-up that has been adopted with great success by many rod builders. He makes a mixture of equal parts isopropyl (rubbing) alcohol and liquid soap. Immediately after using epoxy glue, he thoroughly washes his hands with the mixture.

Non-flowing epoxy

There are some special epoxy adhesives that do not flow. Some are nothing more than regular epoxies to which various fillers have been added, while others are completely different formulations. An example of the latter is PC-7, an excellent paste-type cement.

Non-flowing epoxy is ideal for those rod-building situations where there is a slightly larger than normal space between the surfaces to be joined. This might be encountered, for example, in mounting a reel seat that almost fits the blank, but not quite. The space is too small to really build up the blank, but regular epoxy may flow out of the joint.

Where the space between components is large, the familiar bushings are used. There are circumstances, however, where maximum strength is needed, and a quality paste-type epoxy often is the answer. A good example is mounting the butt ferrule for a Unibutt or locking-type reel seat on a big-game rod. The strongest possible filler is a solid "bushing" of cured paste-type epoxy. The sides of the ferrule are straight while the blank is tapered. To keep the blank centered in the ferrule, a band of narrow masking tape (¼-inch) is placed at each end of the blank inside the ferrule. The entire area is then filled with PC-7 or other paste-type epoxy, and the ferrule is slipped on the blank. The same technique can be used on reel seats, gimbals, and any place where maximum strength is important.

I am most familiar with PC-7 so I'll detail working with it. Whenever I can, I prepare the surface the same as I would for regular epoxy glue. However, when I have to join a smooth, highly polished surface that I cannot roughen, I always use PC-7. It has almost three times the shear strength of commonly available epoxies and over five times that of the urethane glues. It is the strongest adhesive I know of for bonding smooth, glass-like surfaces to practically anything.

Be sure to mix the two parts completely. Since each part is a heavy paste, mixing is more difficult. Instead of a piece of paper, mix the parts on a rigid surface such as a board, tile, or piece of glass. A small laboratory-type spatula (about ¼-inch wide) is excellent, but a wood tongue depressor or heavy craft stick works well. The mixture is quite sticky and adheres to practically everything. It therefore must be spread on all surfaces to be joined or pushed into a joint with the flat tool used for mixing. Make sure that joints are fully packed. Any excess will be squeezed out when the surfaces are brought together.

The sticky aspect of PC-7 can be easily controlled with alcohol. For example, a glob of the mixture can be deposited on a surface and roughly spread with the mixing tool. If you then dip your finger in alcohol you can use your finger to push and mold the PC-7. Clean-up is easy, using a rag moistened with alcohol.

Gluing resilient grips

Some kinds of resilient grip materials can be shaped and glued. One that I am most familiar with, Customgrip II, has been formulated so that it can be worked by the custom rod builder. It is a fairly firm material, not a soft and mushy foam, and has a cushion-like feel. That resiliency can be retained when pieces are glued together only if a special gluing technique is followed. If epoxy is used, the glue joint will be a hard, rigid line, and the grip cannot be shaped evenly. Use the following method and you will not be able to feel any difference across a glue line.

To start with, you must use a thin (runny) contact cement such as Weldwood. This must be further thinned with a quality volatile solvent like Crystal Flo. I pour a bit of the contact cement into a clean glass ashtray. I then add about one part Crystal Flo for each three or four parts of cement, until I have a mixture with the consistency of pancake syrup.

For an applicator I use a triangular piece of Customgrip II. This is made by cutting the end, at a 45° angle, off an unshaped turning square of grip material. I dip one corner of my applicator into the thinned cement and spread the glue on both faces of the grip material to be joined. This is a thin layer but it is essential that it be forced into the pores. The only way to get the correct viscosity to penetrate into the pores is by thinning the cement.

After the cement is dry to the touch, about 15 minutes, the two pieces can be brought together all along the glue line. They will bond on contact, making it impossible to slide them. For this reason, sections to be joined should be aligned before they touch. If the pieces are full cross-sections of grip with a hole in the center, slip them over a dowel or piece of scrap blank to align them.

While joined pieces bond on contact, the strength of the bond is only a fraction of what it can be. Momentary pressure is needed. The more pressure I can apply to squeeze the joint together—*even if only for a fraction of a second*—the better. At times I mash, pound, hammer, push, or squeeze to bring the surfaces into tight contact. It is important.

This method of gluing resilient grip materials was developed after much experimenting and testing by a number of RodCrafters. One of them, Glen Haynes, did the lion's share, and he led the way for the rest of us. When the technique is used as explained here, the resilient glue bond should never fail on a fishing rod.

Exactly the same method is used to glue Customgrip II to cork for all kinds of inlays.

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THREE

Reel Seats

The usual objective in making a custom rod is to produce the finest rod possible. When we consider that the biggest investment is in time and skill, it only makes sense to use the very best components available. Reel seats, like other components, vary greatly in quality, and the rod builder must be able to judge which to use. It is foolish economy to use any but the highest-quality seats, since replacement of one that becomes defective is a major, time-consuming, and costly repair.

There was a time not too many years ago when reel seats could be categorized as being made of anodized aluminum for freshwater rods or of chrome-plated brass for saltwater. While there was a certain range of quality in each category, things were fairly simple and straightforward.

Today, we have reel seats made of new composite materials, stainless steel, a broader range of anodized aluminum, and chromed brass. No longer is one material used just for fresh- or saltwater but instead its inherent properties are much better utilized in a specific design. At the present time we have some of the finest reel seats ever made—and some of the poorest. On the very poor ones, every penny of manufacturing cost has been shaved to the minimum with no regard for quality, only appearance.

Between the new products and the look-alike gimmickry, a rod builder can easily become confused. Let's first try to get some perspective on reel seats in general.

COMPOSITE REEL SEATS

To save weight and increase strength in the aerospace industry, metals have been replaced wherever possible with composite materials of new man-made fibers and resins. Fuji, known worldwide for its innovations and quality, took the same approach to reel seats. The body and locking nut are made of space-age resin and graphite fibers. The only metal used is in the hoods, and here again Fuji's approach was revolutionary with their choice of strong stainless steel. The result was a reel seat light enough for freshwater rods, yet with enough rugged strength for saltwater rods. It's a unique seat in a great many ways.

The seat is entirely corrosion-free in saltwater and fresh. Even the finest chromed brass seats will corrode and lock up unless meticulously cleaned after every use. This simply can't happen with a Fuji seat because both threads and nut are made of graphite composite. Special patented nylon liners inside the hoods keep the metal of the reel foot from contacting the stainless-steel hood, thereby totally eliminating any possibility of electrolysis. This decomposition of metal is frequently confused with corrosion because the results are so similar. The typical anodizing on aluminum seats is only a thin coating. It is easily scratched inside the hoods, exposing the metal to electrolysis from contact with the reel feet.

Fuji composite reel seat. Regular; with lined stainless-steel hoods; and heavy-duty molded hood seat.

Fuji graphite bushing seat eliminates need for separate bushings.

The seat is about 60% lighter than a comparable chromed brass seat, yet the stainless steel hoods are stronger than stamped, chromed brass or stamped aluminum. The weight saving is even more dramatic when Fuji is compared to big-game machined-hood chromed brass seats. In a test, a Penn International 80 big-game reel was mounted in a Fuji FPS-H heavy-duty molded hood seat, and mechanically twisted. The foot of this great reel bent before the seat failed!

All models of Fuji seats will hold a wider variety of reels—and hold them tightly, without any wobble—than any other reel seat I've ever used or tested. There is no standard shape for reel feet, and they vary greatly in length, width, slope, thickness, radius, etc. This has always been a problem for seat manufacturers and rod builders alike. (Always test a seat and reel combination before you assemble a rod.) Mr. Ohmura, owner of Fuji, told me they invested heavily in research and in the precision tooling necessary to make the compound bend in the stainless hoods. The other reason the hoods hold so many reels so well is the unique nylon liners which mold themselves to the reel feet.

The sliding hood is always in perfect alignment since it travels on a keyed slot. It is driven by a large, tapered nut which is easier to tighten than the usual two-nut arrangement. Fuji's single nut holds better because the threads are square, 50% deeper, and to closer tolerances. Despite this, it is less likely to jam from dirt, grit, and sand due to the nature of the graphite composite.

The inside of the seat is grooved for better glue bonding. Finally, since the seat is not made of metal, it is warm to the hand in cold weather or cold surf.

That's a pretty impressive list of features, and all are backed up by improved performance. So much so that in recent years the Fuji seat has replaced thousands and thousands of aluminum and (especially) chromed brass seats.

Now you might think that with a new product using a new technology, other companies would enter the field and compete in trying to engineer and design an even better product. Isn't that what happens with airplanes, computers, and automobiles? Well, it sure didn't happen with composite-material reel seats. Other companies came into the picture, but all of them had only one goal—how to make a seat that looked like the Fuji but was cheaper.

I can honestly say that I have not seen one composite seat that had any improvement over the Fuji or one that was even as good as the Fuji seat. And that is not because the seat could not be improved upon. Since its introduction in 1979, Fuji has changed resin systems four times as better resins became available; they increased the graphite fiber content; they changed from a tapered tube to a straight tube; they engineered and introduced two different heavy-duty versions of the seat, and a trigger model; redesigned the locking nut to its present stronger-but-higher tapered design; redesigned improved hood liners and put them in every size seat; and have steadily improved their cosmetics. Those are just the improvements I know about. I am sure there are more.

During the same period, what did the cheap imitators do? They tried to make the seats even cheaper. They used cheaper resins with considerably less graphite fiber. In fact, some of them are just weak plastic seats that have a tiny bit of chopped fiberglass or *no reinforcing fiber at all*. None of them, not one, has the nylon liners inside the hoods. They are therefore subject to electrolysis and will not hold a wide variety of reels wobble-free. The hoods themselves are a much poorer stamping, made with a cheaper grade of stainless that pits and corrodes in saltwater. One I tested had hoods of unanodized aluminum that will corrode even in freshwater. Most of the imitations are made with such poor tolerances that if you hold the seat in one hand and twist the sliding hood sharply to the side, it will pop out of the keyed slot. I've heard of many cases where the hoods jammed or cracked when they were overtightened in an attempt to stop reel wobble.

Perhaps I've raved too much here, but this philosophy of making it cheaper has become far too prevalent in the tackle industry. Through good competition we should expect to get better products at lower prices. All too often, however, the emphasis has been on cheaper and cheaper imitations with total disregard for quality, and frankly I am disturbed by it. Old adages like "you only get what you pay for" don't seem to get the message across. So I have tried here to make the reader aware by discussing an actual example in detail.

Now that I've aired some of my frustration, let me say that obviously not everyone in the tackle business has the same philosophy.

ALUMINUM REEL SEATS

Pure aluminum is rather difficult to machine and stamp. It is therefore made in a wide variety of alloys for ease of processing. An alloy with a higher aluminum content will have to be machined at slower speeds, but will be more corrosion-resistant, accept a better polish, have higher tensile strength, and take anodizing better—all properties that make for a better reel seat. A less expensive alloy with a lower aluminum content can be machined faster and therefore will lower production costs, but the resultant seat will not be as good. Another example of getting what we pay for.

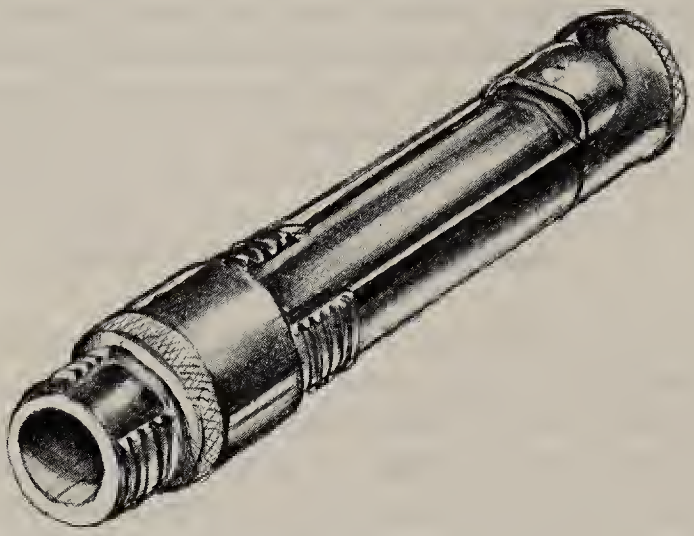
Aluminum is still very much the preferred material for fly-rod seats. Fly fishermen are prone to be traditionalists. They seem to lean toward conservatively wrapped rods without fancy butt wraps. Most of them would prefer the decoration provided by a tastefully designed reel seat, probably one with an attractive wood insert. If it is a particularly important rod, and if the owner can afford it, he would opt for an elegant seat of nickel silver. That, however, is the *crême de la crême* and by far the greatest number of fly rods are made with aluminum reel seats.

As rod builders, we need to be able to evaluate quality in a reel seat. Some things, such as the alloys used, are beyond us. We have to rely on the integrity and reputation of the manufacturer. However, there are many easily discernible differences, such as the wall thickness. Some seats have walls so thin that there is barely any metal at the bottom of the threads. When a seat like this is inadvertently jammed or badly bumped, it will be ruined. Wall thickness is especially important on the hoods. Thin walls are apt to split if the hood is screwed onto the reel foot too tightly, or if they are forced over larger-than-normal reel feet.

Threads on aluminum seats can be formed by rolling or by machining. Large-volume, high-speed equipment is employed to roll threads using less desirable alloys. The manufacturer goes to great lengths to use the minimum amount of material. Rolled threads are made with poor tolerances, and a single nut will frequently vibrate loose. They also show signs of wear.

Machined threads can be of various designs, and they require a thicker, stronger wall to start with. Quite close tolerances can be maintained so that a single nut will adequately hold a reel. Threads too fine will tend to bind if dirt or grit gets in. If too coarse, however, the nuts will be too loose and/or an excessively thick wall will be needed. A good average is 16 pitch (16 threads per inch).

On aluminum seats except some specialized saltwater models, the fixed hood is always stamped. The quality of the stamping, along with the previously noted wall thickness, can vary. The edge and body of the hood should be nicely finished, with no stress marks or "orange peel" (indicating that the die was used longer than it should have been). The sliding hood can be either stamped or machined. Better seats will have machined hoods. These are more expensive to make, but will have thicker walls and greater strength. If placed in stress situations, the machined hood is far less likely to deform or split. Since the hood has no pocket, it is always aligned, and it is a better looking seat overall.

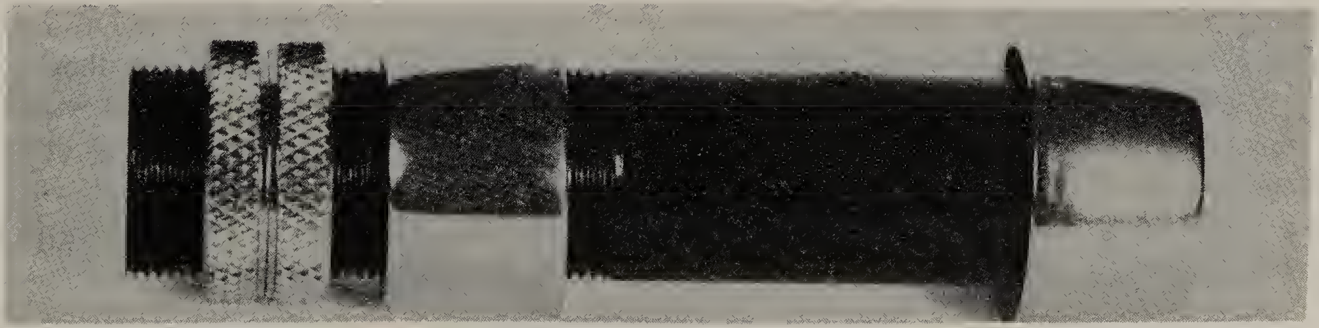


Milled-slot fly-reel seat. The slot helps hold the reel securely and reduces side pressure on the hoods.

On fly-reel seats the best-quality models have a milled slot the entire length. This slot is more expensive to produce, since it involves an additional cutting operation after the barrel has been threaded. It also requires thicker walls to start with. The slot does the best job of holding the reel foot in place and reduces the side pressure on the hoods.

While technically not reel seats, sliding reel bands are used on some ultralight fly and spinning rods to hold the reel onto the grip. The most distinguishing feature of top-quality models is that the inside is not only smooth, but has a slight taper on the leading edge. Again, this is a case where cost is increased because of the extra machining operation. However, this design will fit better over the reel foot without causing the other end of the band to be levered into the cork, forming dents. They also have a narrow band of raised, fine knurling to facilitate tightening them onto the reel feet.

Today we have excellent machined-hood big-game seats made of marine aluminum. The credit for these seats must go to AFTCO, another world leader in quality, innovation, and reliability. Some years ago they brought out the first successful line of aluminum butts for big-game rods. Initially the butts were used with heavy chromed brass reel seats. AFTCO then introduced the Unibutt, a single, lightweight, all-aluminum component that was both trolling butt and heavy-duty machined-hood reel seat. These were a huge success and have almost entirely replaced the less reliable wood butts.



AFTCO machined-hood aluminum big-game reel seat.

In recent years, "blank-thru" or "straight-through" handle assemblies have become increasingly popular for offshore rods. A longer blank is used, and instead of disassembling above the reel seat, the rods are made in one piece with the blank going clear to the gimbal. AFTCO took the identical heavy-duty seat they were using on the Unibutt and made it available as a slip-over model.

No longer was aluminum a material used only in freshwater. Through top engineering and design, AFTCO showed rod makers how to shave away excess weight. These components have a unique marine anodizing with a hard coat that is practically scratch-proof and immune to the corrosive effects of saltwater.

NICKEL SILVER REEL SEATS

As mentioned earlier, nickel silver reel seats are considered the ultimate by many fly fishermen. The metal does not contain any silver. In tubular form, 18% is nickel, 12.18% is zinc, and the balance is copper. In bar stock, which is preferred for seats because it is more machinable, only 12% is nickel.

This is a hard, tough, malleable, and ductible metal with about three times the strength of aluminum. The zinc content gives it a unique self-lubricating quality that is ideal for close-tolerance threads and jam-proof, sliding, machined hoods.

The 12% bar stock alloy is a beautiful white metal with a gold overcast that harmonizes exceptionally well with any wood. Nickel silver also has traditional appeal and polishes exceptionally well. Raw-material cost of the preferred bar stock is about four to five times that of aluminum.

CHROMED BRASS REEL SEATS

For years, chrome-plated brass reel seats were the standard for saltwater rods. No longer. Fuji composite seats and the AFTCO Unibutts and slip-over reel seats have to a great extent replaced them. These are much lighter in weight and more than strong enough to do the job. I do not mean to imply that chromed brass seats are inferior or that they will disappear from the scene. Rod builders still need a working knowledge of these seats.

Many saltwater and trolling rods disassemble at the reel seat. Two kinds of ferrules are used for this purpose: a simple friction type and a screw-locking type. On the friction type, the male ferrule is a smooth cylinder that slips tightly into the open end of the reel seat. Friction ferrules should really be used only on comparatively light-duty rods. For the strongest, most secure connection, the locking type is decidedly superior.

On the locking type, the end of the reel-seat barrel projects beyond the fixed hood and is threaded. The male ferrule which fits over the butt of the blank has a threaded and knurled collet nut on the rod end. When the male ferrule is inserted into the reel seat, the collet nut engages the threads on the body of the reel seat and is tightened to lock the ferrule in place. To automatically align the blank and the guides with the reel seat, there is a V-notch in the bottom of the male ferrule. This slips over a pin across the inside diameter of the reel seat. When the locking nut is tightened, the V-notch is seated securely over the pin. This makes it impossible for the blank to turn or rotate inside the reel seat.

It should be mentioned here that exactly the same locking system and alignment pin are used on the AFTCO Unibutt.

The strain given saltwater rods is considerably greater than that given freshwater rods. Therefore, the wall thickness and shape of the reel-seat hoods are of particular importance. For lighter rods stamped hoods are satisfactory provided the walls of the hood are thick enough, and the hood is large enough to fit over the reel foot of any reel that might be used with the rod. Avoid chrome/brass reel seats with thin-walled hoods.

For big-game offshore trolling rods the best seats are made with heavy machined hoods. The massive strength of these hoods will hold up under any fishing pressure. Some other component making up the chain from angler to fish will break before the machined hood. Also, the machined hood does a better job of eliminating any side-to-side wobble of the reel.

Top-quality brass/chrome seats will have a round thread design rather than the common V-shaped threads. This construction increases wall strength of the threads and helps prevent binding or freezing up from dirt in the grooves.

MOUNTING REEL SEATS

The inside diameter of a reel seat is generally quite a bit larger than the outside diameter of the blank over which it must be mounted. Also, the blank is tapered and the reel seat is not. Various materials can be used to fill this space while keeping the blank cantered.

For many years the only commercially available reel-seat bushings were cork cylinders about 1⅛ inches long. Still often used, they come in assorted outside and inside diameters to fit reel seats and blanks of different sizes. They are easy to sand and taper-ream. When two or three are mounted with epoxy glue, they are strong enough for most freshwater and light-duty saltwater rods.

The most common technique is to select an outside diameter that will fit the reel seat, enlarge the hole in the cork with a round file or a tapered reamer, and glue the bushing in place on the blank. If the outside diameter is a bit too large to fit the seat it can be reduced before gluing to the blank. This is easily done by using a metal rod or wood dowel as a mandrel for turning. Select a size (O.D.) on which the cork bushing can be force-fit so that it will not rotate. If the diameter of your mandrel needs to be slightly larger, use masking tape to build it up. With the bushings in place, chuck the mandrel into a lathe or electric drill and sand them down to the proper diameter.

Another approach is to fit the hole in the bushings to the blank and glue the bushings in place on the blank. Then, if a rod lathe is available, the outside diameter can be reduced by sanding to fit the reel seat. The outside can also be hand-sanded to reduce the diameter but care must be taken to remove the same amount of cork all around the bushing. Otherwise, the seat will not be centered on the blank.

In pursuit of both greater strength and greater sensitivity, rod builders have been increasingly turning to bushings made of harder materials. Wood can be used but the proper power tools are needed to bore, shape, and taper-ream it to fit the blank. For a while, high-density phenolic bushings were available to fit the three smallest Fuji reel seats. The difficulty of reaming the hole to fit the blank caused them to be discontinued. They were replaced with a much more easily worked material which we had earlier introduced and called Sensitron.

Weighing approximately the same as cork, Sensitron is very rigid and very strong. For making bushings, it has an excellent strength-to-weight profile, yet is quite easy to sand, ream, and drill. The same techniques for fitting cork bushing discussed above and in the chapter on glues and gluing can be applied to Sensitron. The hole in these bushings is most easily enlarged by drilling.

The best glue bonds will occur if the bushing surfaces are rough and space is provided for a film of glue. On cork, it helps to file a few small grooves. While the same can be done on Sensitron, the open cellular structure that results from using coarse sandpaper is an excellent gluing surface.

An entirely different material, masking tape, can be wound on the blank in bands to form bushings. It is lower in strength than cork or Sensitron, but is suited to most light freshwater rods. This is one of the fastest ways to fill the space between the reel seat and the blank. The tape should be wound as tightly as possible for strong, firm support, but the greatest strength will be gained by leaving open spaces between the bands and at each end of the seat. When epoxy is applied to the surface, also spread some along the side of each tape bushing, working it into the edges of the tape. Apply epoxy liberally to the spaces between bushings for maximum reinforcement.

As explained under *Non-flowing epoxy* in the chapter on glues and gluing, the strongest method of mounting a reel seat (or the ferrule for a Unibutt) is with a quality paste-type epoxy such as PC-7. Here, a band of 1/4-inch masking tape is placed on the blank at each end of the area covered by the seat. Its sole purpose is to offset the taper and keep the blank centered. It plays no part in providing any structural strength to the assembly. The tape bands are built up to the point where the seat fits on easily but without any side-to-side wobble. The entire area between the tape bands is then completely filled with PC-7 and the seat is slid into place.

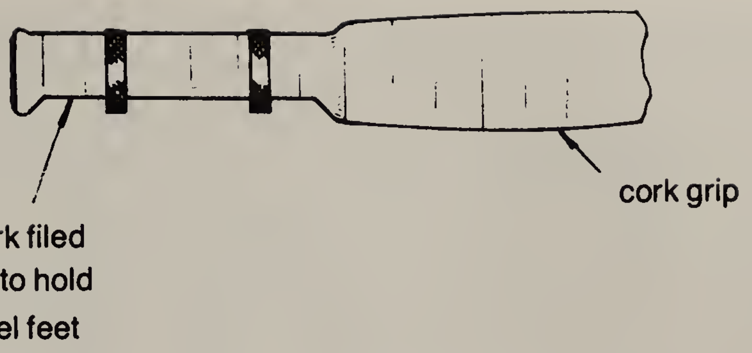
A somewhat similar method is used by some builders. Instead of filling the space between the two narrow tape bands with a non-flowing epoxy, a mixture of fiberglass and regular slow-cure epoxy glue is employed. RodCrafter Pete Marken uses boat-building fiberglass cloth cut to the required width and length. As he winds it on, he saturates each layer with epoxy. A generous layer of epoxy is applied on top, and the seat is slid into place with a twisting motion in the same direction as the the fiberglass was wound.

SPECIFIC INSTALLATIONS

All-cork reel seats

Let's now direct our attention to the installation of some specific types of reel seats. The lightest is the all-cork seat with sliding bands used on fly rods. This is flared on the butt end to keep the reel bands from sliding off. The other end is tight against the grip. As is true with all cork work, the cork seat can be fabricated separately by the rod builder, then taper-reamed and glued to the blank. Or it can be built up of cork rings glued directly to the blank, then shaped on a rod lathe or by hand. Of the two methods, the latter—fitting and gluing rings to the blank—will be stronger. This is because it is much easier to get a perfect fit of each cork ring only 1/2-inch long than it is to taper-ream a longer prefabricated section. Whichever method you use in making the all-cork seat, complete the work on the seat before going on to the cork hand grip so the reel bands can be slid into place.

The outside diameter of the straight cork cylinder is determined by the inside diameter of the reel bands. They can therefore be used as templates. For the bands to slide up over the reel feet, the cork will have to be cut flat on one side. This flat surface also seats the reel and prevents it from turning on the cork. Use a coarse flat file and clamp the cork so that it cannot rotate. Make sure this flat side is aligned with the blank and the future position of the guides. The flat will extend all the way to the end of the cork seat that fits against the grip. On the butt end it will feather into the enlarged flare. Create the flat in small increments and check the depth by attempting to mount the reel. You have cut deep



All-cork fly-reel seat with sliding reel bands must be filed flat on one side to hold reel.

enough when the reel bands can just be forced up over the edge of the reel feet. Finish sanding with fine-grit paper, rounding the edges of the flat just slightly.

There are a number of ways the butt end of an all-cork seat can be finished. A plug of cork can be cut to size to fit into the open end. After it is glued in place, it can be sanded flush with the end of the cork seat. This is light, simple, and neat. The only drawback is that the cork can be damaged and crumbled when the rod is rested vertically on the butt. Better protection and a more finished appearance results with a butt plate. The easiest type to use is one-piece of aluminum or nickel silver, machined so that a plug projects. This plug is mounted inside the butt of the blank. Either use a nonflowing epoxy such as PC-7 to fill out the space around the plug, or build up the plug with a bushing of cork or masking tape. These butt plates, incidentally, are perfect for engraving. A jeweler or trophy shop can engrave the length and line weight (8′-6) or the owner's initials on the plate before it is installed on the rod.

The same techniques apply to finishing the butt end of an all-cork spinning-reel seat with sliding bands. A nice touch in delivering a rod with sliding rings is to wrap thin bands of masking tape at the ends of the straight cork cylinder. The sliding metal rings can then be pushed over the tape and remain stationary instead of clanking about loosely.

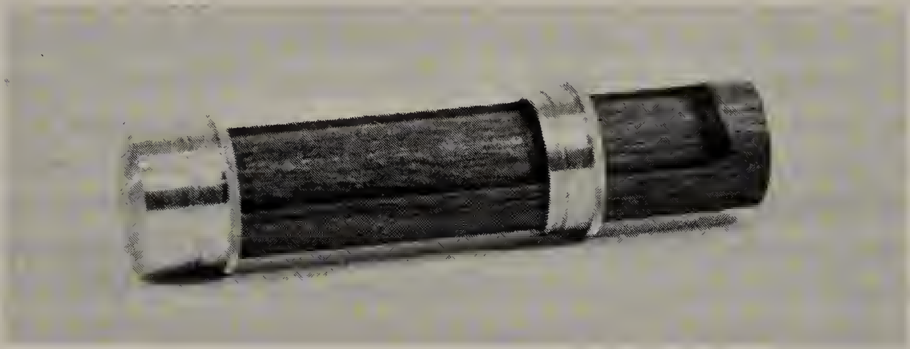
Machined metal butt plate is ideal for finishing end of all-cork fly-reel seat.

A cork fly-rod seat can be built with a fixed hood cap and only one sliding reel band. The technique is much the same except the butt end of the cork is not flared. It is sanded to the correct outside diameter so that the fixed hood cap can be slipped on and glued. Depending on the size of the single sliding reel band you may or may not have to file a flat side in the cork.

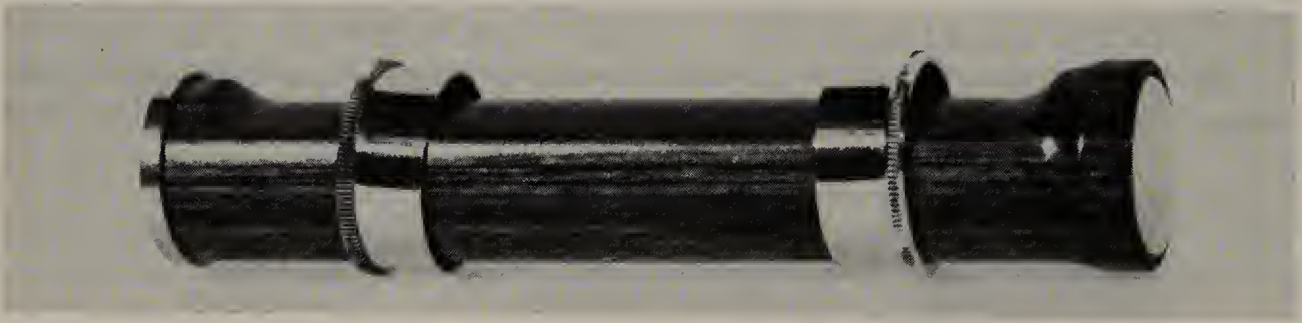
Classic wood fly-reel seat

A variation of this type of seat was found on many of the old classic splitcane fly rods. Instead of the seat being made of cork, it was of hardwood such as walnut. A fixed hood cap was mounted on the end and there was a single reel band of nickel silver. While the reel is not held as securely on this classic seat as it is on a threaded seat, it will retain light reels, is very attractive, and evokes feelings of nostalgia among many fly fishermen.

To make this seat, turn down a cylinder of hardwood small enough so that the fixed hood cap will just fit over the end. A flat can be cut on one side with a saw, then finished with sandpaper. As with the all-cork seat, make the flat only deep enough so the sliding reel band will fit tightly over the reel foot. Depending upon the diameter of the hole through the center of the wood cylinder relative to the outside diameter of the blank, you may have to build up the blank. After gluing all parts in place on the blank, use your favorite protective finish.



Classic wood fly-reel seat with milled slot instead of simple flat side.



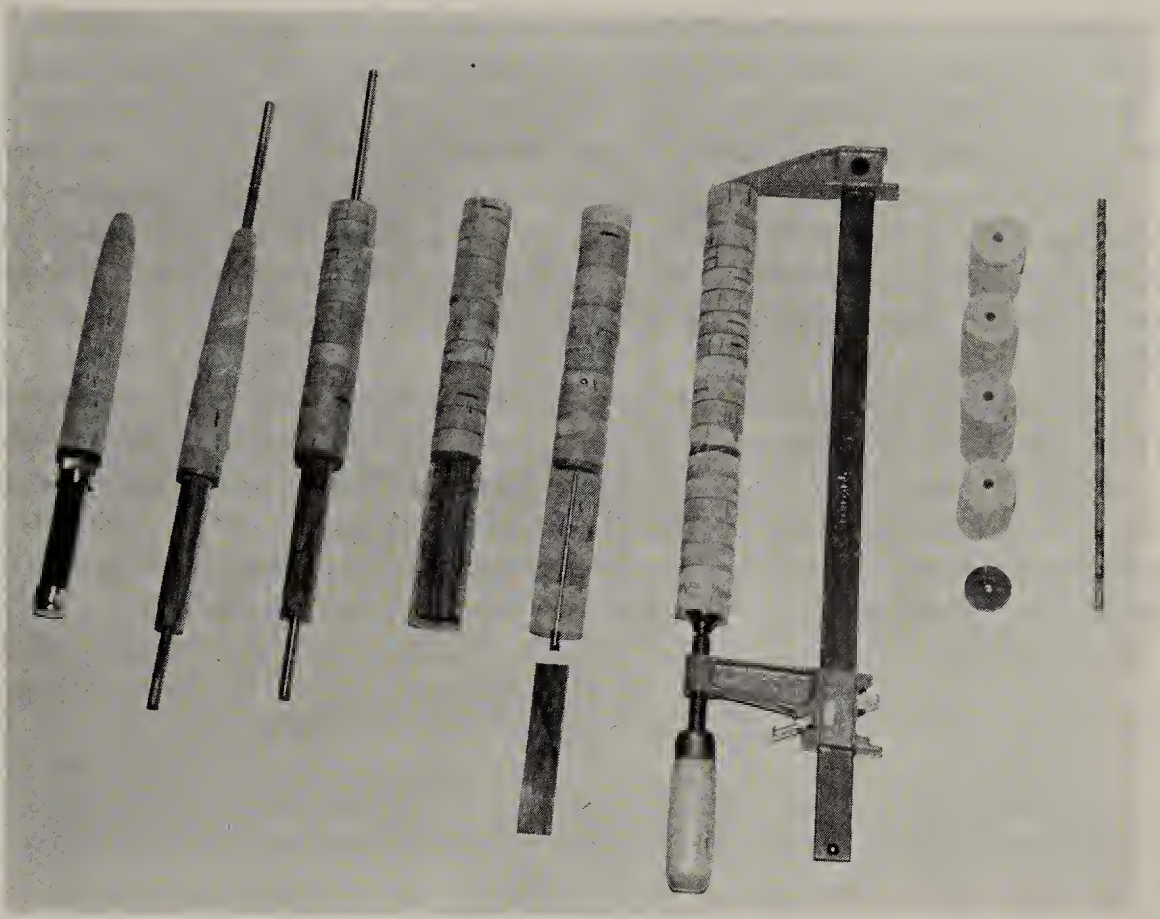
R. French seat of nickel silver and Customwood.

A modern variation of the classic wood seat is the R. French fly seat. Instead of a fixed hood on one end, it uses two finely knurled nickel silver sliding bands—much the same as an all-cork seat. The 3¾-inch-long body is of resin-impregnated Customwood, and the recessed butt plate and finishing cap are nickel silver. If you prefer to make your own, the technique is essentially the same as for the all-cork seat.

Cork-and-wood fly-reel seat

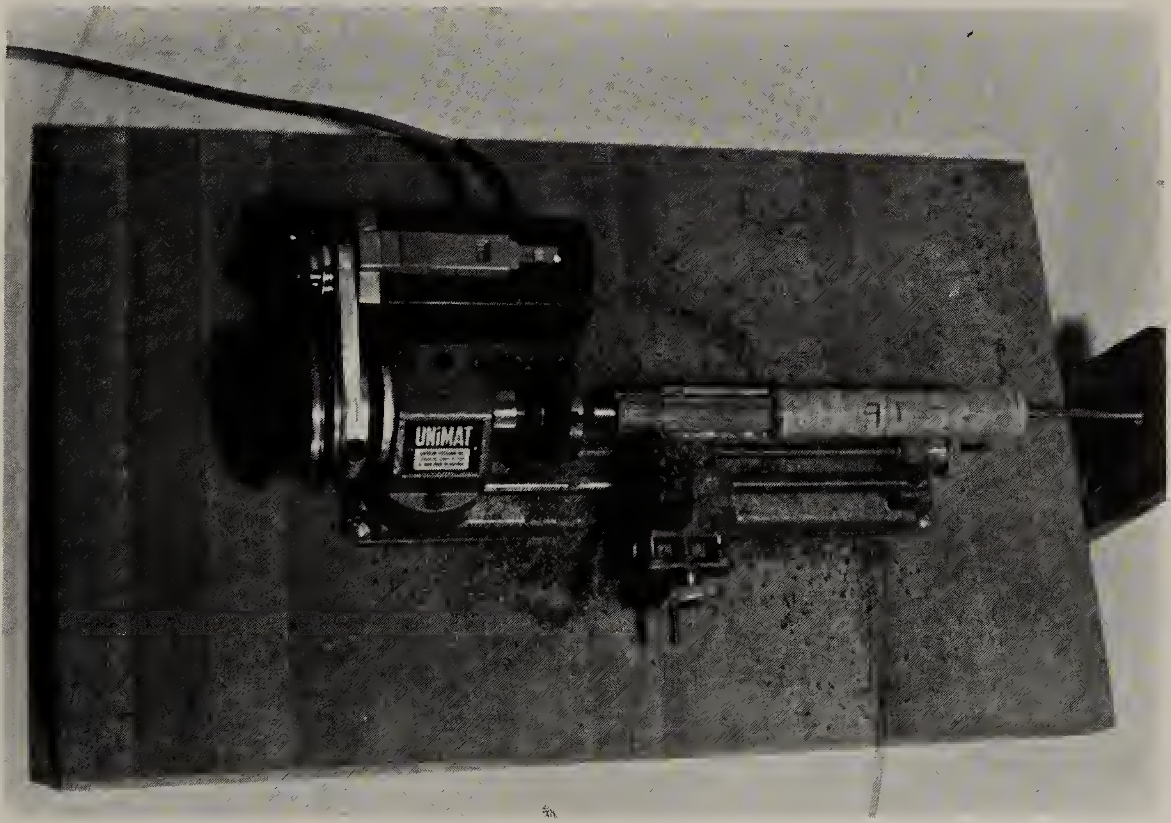
A famous RodCrafter, Don Phillips of Windsor Locks, Connecticut, makes a seat that combines the beauty of wood and the gripping resilience of cork. Don was the inventor of the boron rod, and later the boron/graphite hybrid fly rod. Since his blanks are of solid construction, they have very small diameters, usually $^3/_{16}$ to $^1/_4$ inch at the butt. He created his seat of a sliding fly-reel band and a pocket butt cap to keep the size proportionate to his unique rods. The creative addition of wood stems from the fact that he is "partial to the aesthetics of wood grain."

Don builds his seat and hand grip together in one unit on a mandrel. He uses



Steps Don Phillips uses in making his cork-and-wood fly-reel seat and grip.

nineteen cork rings with a thin hardwood spacer added between the seventh and eighth corks. After the glue has dried on his cork cylinder, he uses a hacksaw to carefully cut away about the top one-third of the cork on one end. This longitudinal cut is made up to



Turning the cork-and-hardwood seat section.

the hardwood spacer. The mandrel is left in the cylinder during the cutting operation to provide a straightedge against which to guide the hacksaw blade during the longitudinal cut. This is similar to making a deep flat in the cork, but because of the amount of material being removed, it is cut away instead of filed.

Still with the mandrel in place, a hardwood block is glued onto the area where the cork segment was removed. The size of this hardwood block matches the size of the cork cylinder. After the glue has cured, Don removes the mandrel and replaces it with a longer turning mandrel. This is mounted in a modified Unimat lathe for turning the cork-and-wood composite.

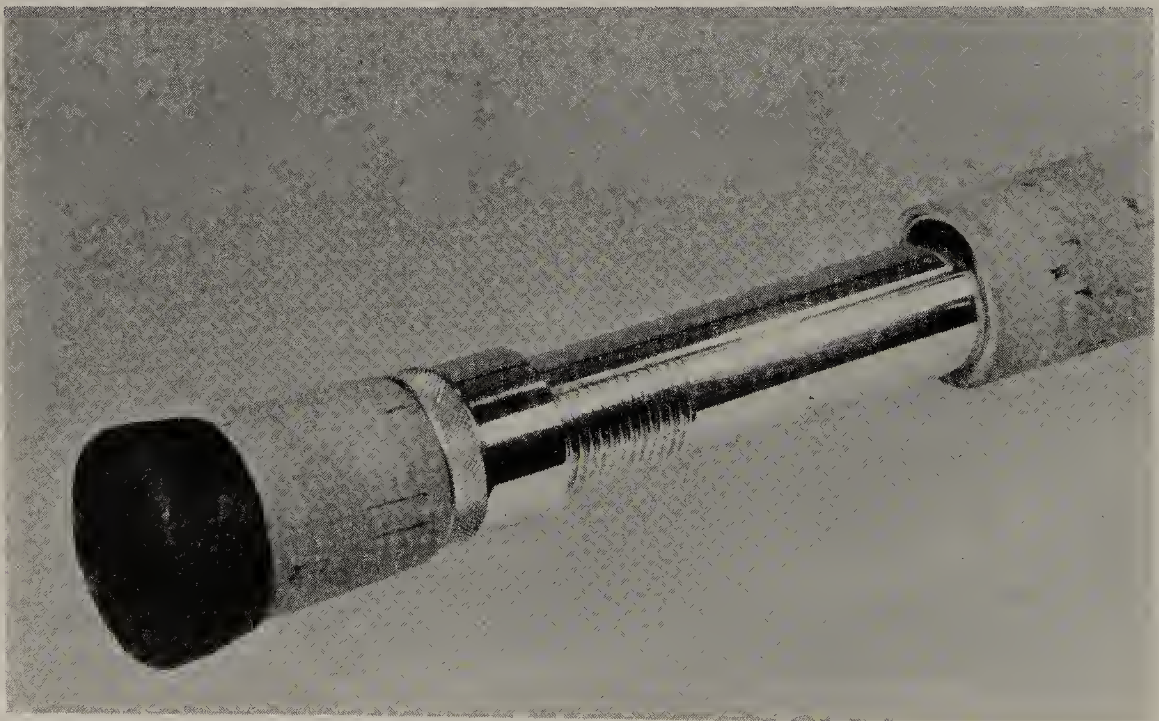
When properly finished, the end result is a reel seat that has a good firm base for the reel feet, attractive wood-grain segments, and a resilient cork shank that aids in anchoring the sliding reel band. Don points out that his approach is designed for small-diameter blanks, such as his own boron/graphite blanks and regular graphite blanks. Large-diameter fiberglass blanks might require some intricate cutting and notching of the cork and wood to accommodate relatively small-diameter reel bands.

Reverse-locking fly-reel seat

In recent years there has been a great deal of interest in reverse-mounted, or up-locking, fly-reel seats. Instead of the fixed hood being located at the butt end, it is on the front end of the seat. The fixed hood can be against the cork grip, or it can be recessed inside the end of the grip.

One of the reasons this configuration is popular is that it places the reel father away from the butt end of the rod. When a large fish is hooked, most anglers bring the butt of the rod against their stomach for added support while reeling. Since the reel is a few inches from the butt, there is less chance of its rubbing against or catching on the fisherman's clothing.

An up-locking seat also places the reel closer to the fulcrum, or balance point of the



Recessed, up-locking fly-reel seat with short extension butt.

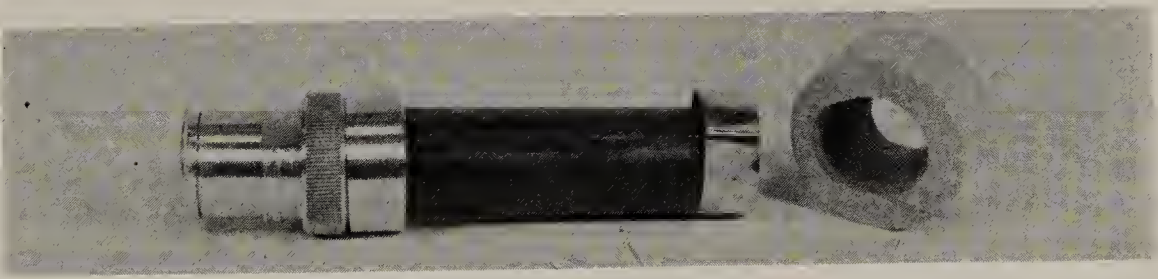
rod, where its weight is minimized on the lighter graphite fly rods. The familiar and traditional balance can thus be maintained.

With the up-locking arrangement the weight of the reel is pulled by both gravity and centrifugal force (during a cast) into the sliding and locking reel-seat hood. This is judged by many to keep the reel more securely locked in place on the rod.

Whether you are using an all-metal seat or a skeleton seat with an insert of cork or wood, you will need a model on which the fixed hood is not made as a one-piece end cap. The preferred seats for this kind of installation have a removable metal end cap which can be placed inside the threaded end of the barrel. The metal cap is best, since it affords maximum protection to the butt of the seat—especially if it is of the type that is mounted on a short plug. Seats with a flat rubber button can be used by switching the rubber button to the threaded end. If the fixed hood is to be mounted against the end of the cork grip, installation is the same as for a conventionally mounted fly-reel seat.

An interesting effect is created if the fixed hood is recessed under the grip. For it to fit under the cork, the outside of the grip will have to be shaped so that it is rather large at the butt end. The length of the fixed hood will dictate whether one or two cork rings will be required to cover it.

Fit the cork ring, or rings, to the fixed hood before the seat is mounted on the blank. Use a small round file to enlarge the center hole in the cork so that it can just be forced over the round end of the fixed hood. Next, enlarge the hole on one side to barely fit over the pocket portion of the fixed hood. Work slowly, checking your progress frequently. The finished hole in the cork should be slightly on the small side so that the cork must be forced over the hood for a tight fit. When the reel seat is mounted on the blank, glue the cork ring, or rings, over the fixed hood. When you are ready to build the rest of the grip from cork rings, simply glue the first ring to the one in place over the fixed hood.



The hole in the cork ring was shaped with a Dremel tool to fit over the fixed hood. It will be glued in place for a recessed, up-locking fly-reel seat.

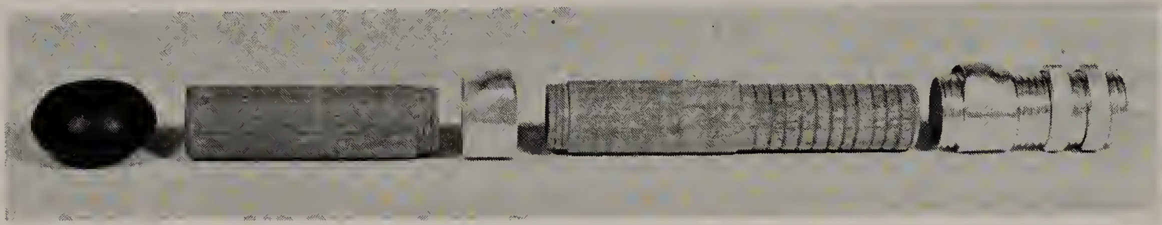
RodCrafter Terry Gibson uses a slightly different technique that assures a perfect fit. He first measures the length of the fixed hood to determine if one or two cork rings will be needed. If two, they are glued together and the bond allowed to cure. He uses the removable sliding hood as a template to draw an outline on the face of the cork ring. Using either a Dremel Moto-tool or a sharp X-Acto knife, he removes enough cork so the fixed hood fits without forcing. After removing the reel seat from the cork ring, a thin coat of Vaseline is applied to the fixed hood to act as a release agent.

He next mixes some “Fix” Wood Dough by Duro with about 25% of Wood Dough and Surfacing Putty Solvent. The previously made hole in the cork ring is blown or brushed clean of loose particles, and the Wood Dough mixture is lightly pasted all round the inside of the cork. The reel seat with Vaseline on the fixed hood is inserted into the cork ring until the edge of the hood is flush with the cork face. The assembly is then set aside to dry thoroughly.

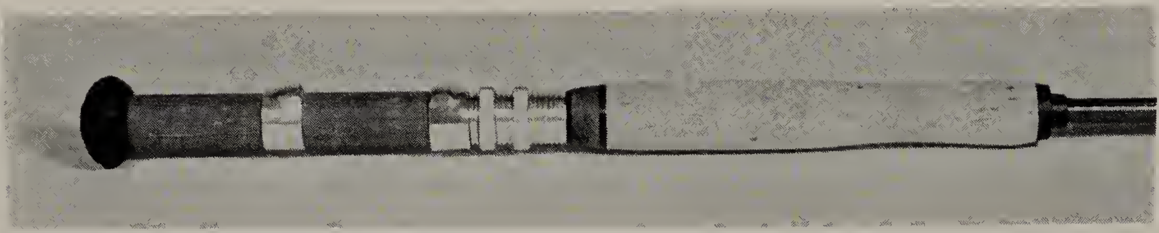
After the Wood Dough has dried, he uses a sharp blade to carefully trim away any that may have oozed out during assembly. The reel seat is removed and degreased with solvent.

Fly-rod extension butts

On fly rods designed to be used in the pursuit of heavier fish, it is best to plan a short extension below the reel seat. One of the problems encountered in taking large fish on a fly is that the reel seat is at the very bottom of the rod. Unless the rod has a short extension, it is difficult and uncomfortable to brace the rod against your body and turn the reel at the same time. The extension can be a permanent one built right on the blank, or it can be detachable.



Parts for wood seat and matching fixed fly-rod extension butt.



Inlaid-wood fly-reel seat with matching wood extension butt.

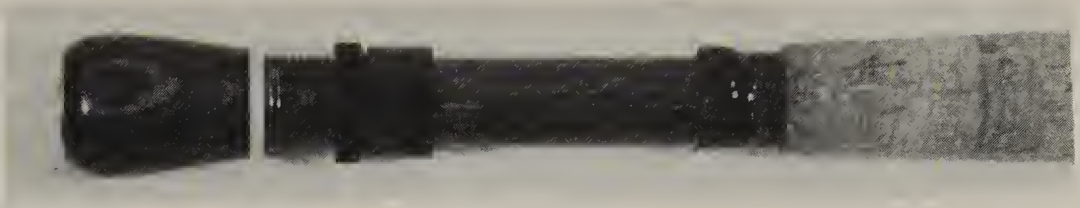
For a permanent, mounted extension you will need a fly seat with removable end cap or button. Mount it on the blank ahead of the few cork rings needed to form the extension. A regular butt cap of your choice is glued over the bottom of the extension.

A detachable butt is preferred by many fly fishermen. It can be carried in the pocket or vest and inserted after the fish is hooked. The removable butt extension can be made entirely by the rod builder, or he can use one of the prefabricated units now on the market.

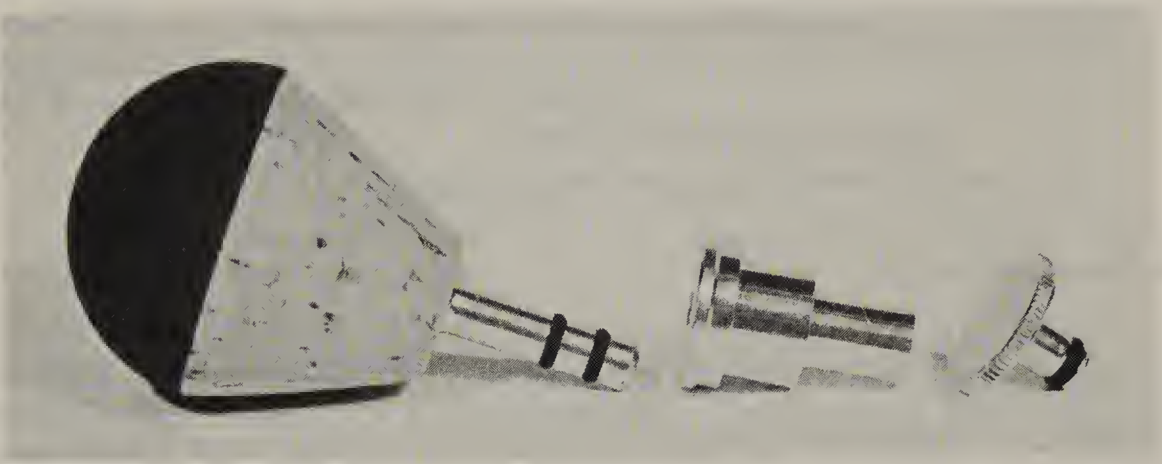
To make your own detachable fighting butt you need a small slipover reel seat, or a fly seat with a removable end cap or button. The seat is mounted in the normal manner flush with the end of the blank butt, and the end cap is left off. An alternative is to allow the seat to extend just far enough beyond the blank to permit insertion of the end cap or button when the fighting butt is not going to be called for.

The shaft on which the extension is built can be a length of hollow glass blank, solid fiberglass, or a hardwood dowel. The end of this shaft will be inserted a few inches inside the butt of the rod blank. If hollow fiberglass, the tapers will therefore have to match. Solid glass or hardwood can be shaped to fit the inside taper of the rod blank.

It is suggested you work with a length of shaft material a few inches longer than your planned needs. Then when the proper fit inside the blank's butt is completed, draw a circle around the shaft at the point where it is flush with the end of the reel seat. Using this reference mark, cut the other end to the length desired for your extension butt. This



Skeleton seat and detachable fighting butt, both fitted with Customwood.



A very comfortable detachable fighting butt made of rubber and cork. Also shown is an adaptor for the seat and end cap it replaces.

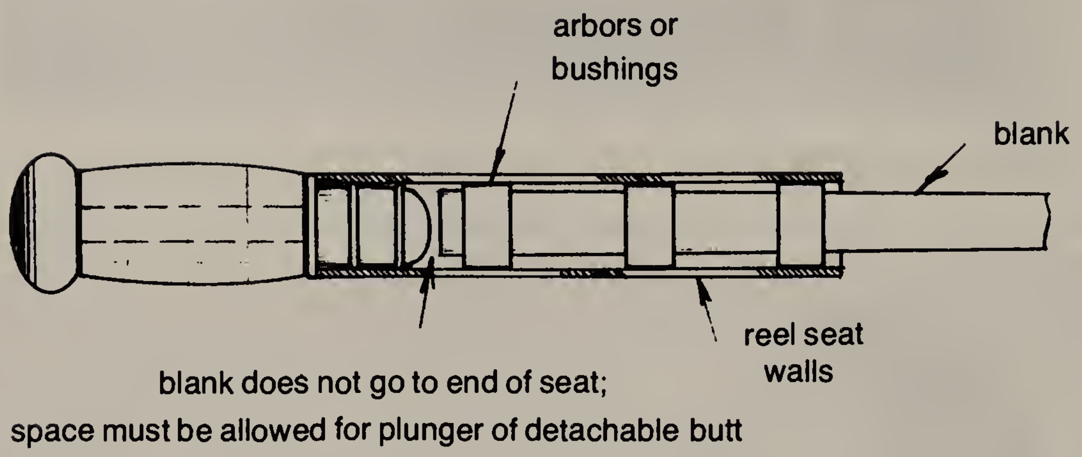
section of the shaft is then covered with cork or resilient grip material and shaped, and the chosen butt cap is mounted. If you use a skeleton seat with a wood insert, consider also covering the shaft of the extension butt with the same wood. It makes a strikingly handsome combination.

The prefabricated detachable butts generally consist of an aluminum piston with 0-rings that fits inside the reel seat. There is also a solid shaft between the piston and the butt cap. Avoid units with a small butt cap, since it is uncomfortable when fighting a fish. The shaft can be covered with any desired material, the same as described above. Since the piston fits inside the reel seat, adequate space must be provided to accommodate it when the reel seat is mounted on the blank. In other words, the reel seat must extend beyond the end of the blank.

To measure for this space, or extension, insert the butt into the reel seat before the seat is mounted. Slide the combination seat and butt over the butt of the blank as far as it will go. Use a scriber to make a small, light scratch on the blank at the forward end of the seat. Remove the seat and measure 1/4 to 1/2 inch *toward the butt* from the scratch just made. At this point scribe a circle around the blank. When gluing the seat on the blank, have the forward end of the seat line up with this scribed circle.

When mounting the seat you also want to be sure that no excess glue accumulates in the space just provided. This is inside the end of the seat projecting past the blank, and into which the butt's piston slides. Mount the reel-seat arbors and allow to dry. Spread glue on the surface of the *arbors only* and slide the seat in position from the butt end. Rotate the seat as you slowly slide it in place up to the scribed circle on the blank and stop. Do not allow the seat to move past the circle. Use a pipe cleaner to remove excess glue from inside the projecting portion of the seat. Carefully set it aside in a horizontal position so that it will not move while the glue cures.

With some detachable extension butts, a pneumatic effect results which can make it difficult to insert the butt into the seat rapidly. This occurs more frequently on an



Blank Position for Fighting Butt

arbors or bushings
blank
reel seat walls
blank does not go to end of seat;
space must be allowed for plunger of detachable butt

With piston-type detachable butt, adequate space beyond end of blank must be allowed for insertion of piston.

extension butt made with a tight-fitting piston and rubber 0-rings, and a blank whose upper end is sealed. What happens is that there is no way for the air trapped inside the hollow blank to escape when the piston is inserted into the seat. The trapped air compresses, then exerts a pushing force against the piston, which tends to push the fighting butt back out of the seat. Since many anglers carry the butt in their pocket and insert it only after a fish is on, this pneumatic effect can create problems when the fisherman is his busiest, or with a really large fish, when all hell is breaking loose!

To eliminate this problem you only have to create an outlet, or escape route, for the air. The seal in the top of the butt section of the blank can be removed, or opened by a small hole in some cases. Some rod builders prefer to drill the smallest hole possible in the barrel of the reel seat. This hole should not go through the blank, but be located just beyond the end of the butt—in the space where the piston is inserted.

Skeleton reel seats

Skeleton reel seats are nothing more than reel seats from which the unthreaded middle section of the barrel has been omitted. In my book *Fiberglass Rod Making* it was explained how the custom rod builder can make his own by cutting out this section of the seat. Even with the wide variety of skeleton seats available today, there are still some situations where you may want to cut a seat either to make a skeleton or to adjust the overall length of a seat.

Manufacturers generally make their seats long enough to mount a reel with the longest conceivable feet. For any specific rod and reel, you may want to reduce the length to proportions you feel are appropriate. On a regular Fuji seat or so-called one-piece aluminum seat, you would have to cut off some of the end of the threaded barrel.

A skeleton seat, however, is different. The space between the two sections of the reel seat will be filled with wood, cork, or practically any attractive and workable material. We will consider each of them separately, but here we want to mention that the length of the insert or the length of the threaded barrel can be shortened if desired.

To cut a seat either to create a skeleton or to shorten the seat, use a fine-tooth hacksaw. A miter box will help to keep the cut at a 90° angle to the axis of the rod. Use a flat file to smooth and true the cut. The Fuji graphite seats will cut cleanly and need little dressing. Cutting aluminum seats often creates metal burrs. Any projecting inside the seat can be removed with a round file or emery cloth held over the index finger. Care must be exercised to avoid scraping any anodizing from the outside of the seat.

On aluminum seats, the bare metal end resulting from the cut will be seated against the next component on the rod. Nevertheless, some rod builders prefer to cover the thin edge with paint. A close color match is usually obtainable from the wide assortment of model paints found in a hobby store. To prevent the solvents in the glue from smearing the paint, cover the painted edge with a coat of clear shellac (or Brilliance Color Sealant).

On spinning seats, the question sometimes arises whether a seat should be mounted with the fixed hood toward the butt or toward the tip. There really is no correct answer. It depends upon the preference of the angler, and is just another way in which the custom rod can be tailored to the person who will fish it.

Skeleton seats—wood inserts

Ready-made inserts are available to fit most skeleton seats in both native and exotic hardwoods. Also available are a variety of inserts made of practically indestructible resin-impregnated wood. This is beautifully grained wood which has had every pore pressure-impregnated with epoxy resin. Since the finish is *in* the wood, not on it, scratches disappear with simple buffing. The degree of gloss, from a soft patina to a brilliant sheen, is controlled by buffing. Customwood, as we call ours, is impervious to fresh- and saltwater, cannot warp, and is stronger than steel.

The usual shape of a ready-made wood insert or one you make yourself is a cylinder with the ends turned down to fit under the two sections of the skeleton seat. This has the advantage of automatically centering the seat components and eliminating separate bushings. It is generally epoxied together, then treated as a single unit when the rod is assembled. With today's small-diameter graphite blanks, this configuration leaves space for adequate wall thickness. If the blank butt is slightly larger than the hole, a small amount of wood can be bored without danger of the insert later splitting. The hole can also be enlarged by filing, but it's tough work. Regardless of how it is done, you can reduce wall thickness only by so much. A split will start in the thinnest portion beneath the seat and extend into the barrel portion.

As the blank O.D. increases, you can make the wood insert in the form of a simple cylinder, eliminating the thinner-walled turned-down ends. The insert presumably would still have thick enough walls to keep from splitting.

Obviously, as the blank diameter increases, you reach a point where the wall thickness of the insert is questionable. My advice is not to risk it. This does not mean you cannot use a wood reel seat on which the hole size (I.D.) is too small for the butt of the chosen blank. Instead, it means you need *a method other than mounting the seat over the blank.*

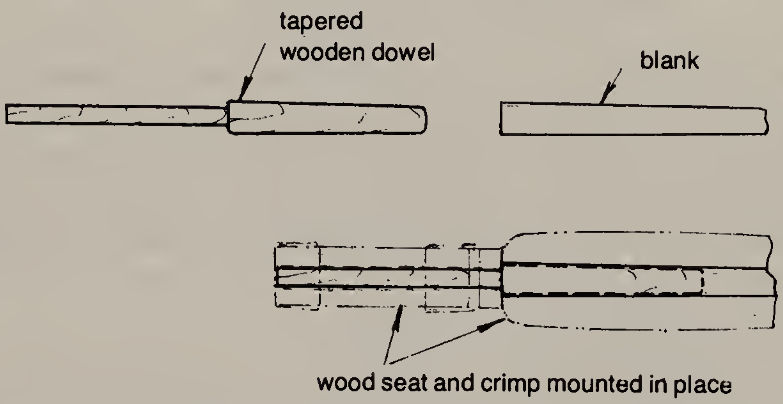
The technique is to fit and glue a dowel *inside* the butt of the blank, allowing a long enough extension on which to mount the reel seat. Before starting an installation of this type you must determine whether or not you want to add the length of the reel seat to the total length of the completed rod. In many cases it is desirable to do so. In others, it is preferred to keep the length of the finished rod the same size as the original blank length.

Let's suppose you have a 9-foot blank and a reel seat that is 5 inches long. If you fit a dowel into the existing blank you would end up with a rod 9 feet, 5 inches long. To make a finished rod 9 feet long you would need to trim 5 inches from the butt of the blank before proceeding to fit the dowel. To do this, measure the length of the seat and carefully measure that length from the butt end of the blank. Mark the blank and cut it with a fine-tooth saw. Square the end of the cut with a coarse flat file.

The dowel can be of hardwood, such as common birch dowels, or it can be of solid fiberglass. Measure the length of the reel seat and add 4 to 6 inches for the portion that will fit inside the butt of the blank. Cut the dowel to the combined length.

First turn down the diameter of the end of the dowel which will fit inside the reel seat. This should be a constant diameter and fit the full length of the seat. Next, taper the end of the dowel which will fit inside the blank and round that end slightly. Check the fit of the parts to make sure the end of the reel seat will be flush with the end of the blank. Mark the dowel at that point with a pencil line.

Roughen the shaped dowel for a better bond. Place a generous amount of epoxy on the inside of the blank. Spread a layer of epoxy on the section of dowel that goes into the blank. Insert the dowel into the blank with a twisting motion up to the previously made pencil line.



Fitting a wood fly-reel seat whose inside diameter is smaller than the butt diameter of the blank. Dowel is first fitted to seat on one end, then tapered to fit inside of blank on opposite end. Parts are all epoxied together.

After the epoxy has cured, roughen the inside of the reel seat and the dowel over which it fits. Coat both with epoxy and mount the seat.

As long as care is taken to obtain a good fit, and slow-setting epoxy glue is used, this technique will result in a rod as strong as any. There should be no concern that the reel seat and butt section of the rod is weaker than on a conventional installation. The grip, glued as it is directly over the dowel projecting from the reel seat, acts as reinforcement and provides great hoop strength at that portion of the blank. I have taken 100-pound-plus tarpon on a rod made in this manner and never experienced even the least hint of weakness or failure.

When making your own wood reel-seat insert, start by boring the desired-size hole. Resin-impregnated wood comes in dowel form, but on regular wood you will have to saw the edges off the turning square. Slip the wood over a mandrel for turning. This can be a threaded rod with a small washer and two nuts at each end, or a steel mandrel (or hardwood dowel) wrapped with masking tape to provide a force-fit. Chuck your mandrel into a lathe or drill for the final shaping.

If your insert is of regular wood, turn it to a diameter just a hair smaller than the O.D. of the seat. This difference allows for the thickness of the wood finish, which should be applied before the insert is mounted.

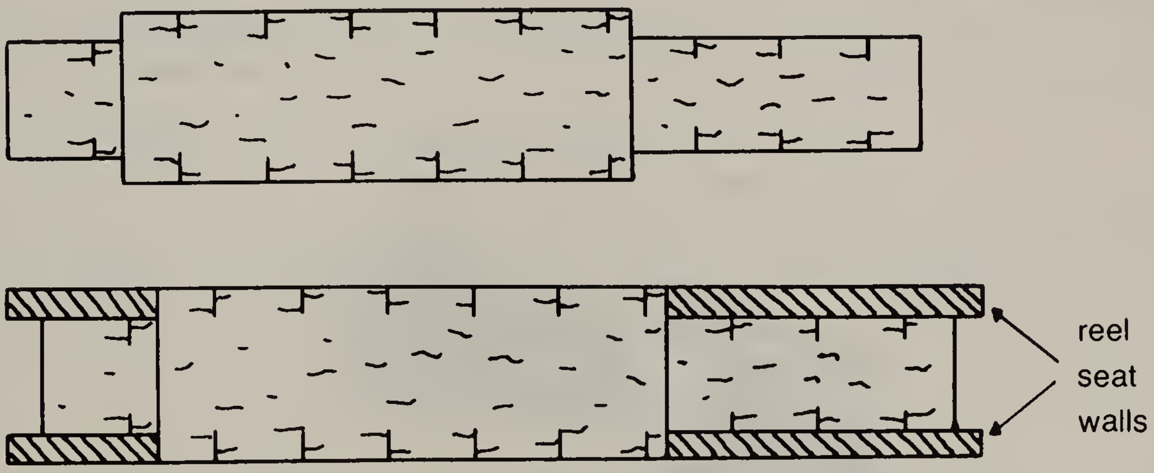
One of the best finishes I have found is called Birchwood Casey's Tru-Oil, a gunstock finish available from some rod-building-supply dealers and most good gun shops. Simply follow the directions on the container, with one exception. If you have chosen a dense, oily wood such as rosewood, first apply a thinned sealer coat of clear white shellac. The first coat of Tru-Oil is supposed to dry in a few hours, but depending upon the type of wood it may require twenty-four to forty-eight hours—but the results are well worth the wait.

Skeleton fly-reel seats, whether made by the rod builder or purchased, can be mounted over the blank in conventional style or in reverse (up-locking) fashion. Obviously, for a reverse installation the cap on the end of the fixed hood must be removable. To mount a skeleton fly seat in an up-locking manner, proceed as explained for regular one-piece fly-reel seats.

Skeleton seats—cork inserts

If cork is used to form the center barrel in a skeleton seat, either of two methods of assembly can be followed. In the first, each component of the seat is fitted and mounted separately on the blank. An arbor sized for the fixed hood is first glued to the butt and the hood section glued over it. Then, the center cork section is constructed as a preformed piece, taper-reamed, and glued to the blank, or cork rings are glued directly to the blank and then turned down on a rod lathe to fit the sections of the seat (cover the fixed hood with masking tape to prevent scratching it during this operation). Finally, arbors for the threaded portion of the barrel are glued to the blank and the threaded section glued over them.

The other method is to construct the cork skeleton seat as a unit. The total desired length of the finished seat is first established. A cylinder of glued cork rings of this length is slipped on a dowel, metal rod, or some other mandrel, and chucked into a lathe or electric drill. The total length of the cylinder is then sanded to achieve the finished diameter of the center portion of the seat. A careful measurement is made of the length of the fixed hood. A length to match is then turned down on one end of the cork cylinder. The depth of this cut is just enough to allow the fixed hood to be slipped in place on the cork cylinder. Work slowly and check your progress frequently. Next, the length of the threaded section of the seat is measured, and the same steps as for the fixed hood are repeated on the other end of the cork cylinder. The two sections of the skeleton seat are glued in position on the cork. When dry, the cork is taper-reamed to fit the blank and the entire unit is glued in place on the blank. For the rod builder making many rods, this method is faster, since a number of complete reel seat units are made at one time. Later, as needed, each can be taper-reamed to fit the particular blank. Some rod builders also feel



Skeleton seat with cork insert can be made by first shaping cork cylinder, over which sections of seat are glued.

that aligning all of the reel-seat components is easier using this technique. Preformed cork inserts are available to fit some skeleton seats.

Skeleton seats—clear insert

Another form of skeleton reel-seat inserts, clear plexiglass, came into being because the diameter of light graphite blanks was too small for woven thread decoration. Many rod builders enjoy creating thread art but were stymied by the skinny graphite blank projecting from the foregrip of light rods. The basic idea behind the Art-Form Seat Inserts, as they are called, is that you place your thread work on a larger-diameter surface—one just smaller than the O.D. of the reel seat. The clear plexiglass cylinder that forms the unthreaded barrel of the seat also acts as a slight magnifier while it protects your artwork.

This clear protective window available right in the angler's hand led to all kinds of creative applications. It seems that whatever the rod builders didn't think of, their customers did. I've seen personal photos mounted on a number of rods and a federal duck stamp on another. I've built a few in which I have mounted a company or school logo cut from printed matter. On one rod I inserted the customer's signature on a color-coordinated background. The larger diameter has been used for all kinds of multi-line inscriptions. I've also seen a striking gold metalflake insert made by coating the inside with a mixture of micro metalflake and wrapping finish.

BLANK REEL SEAT INSERTS

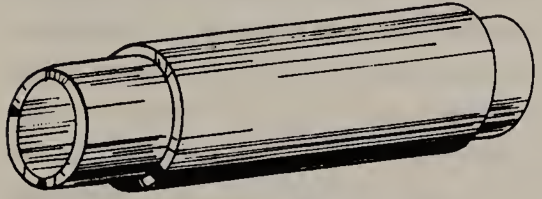


FIG. 1

BLANK WRAPPING TUBE

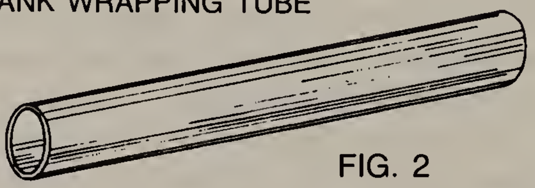


FIG. 2

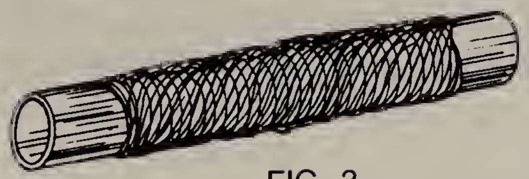


FIG. 3

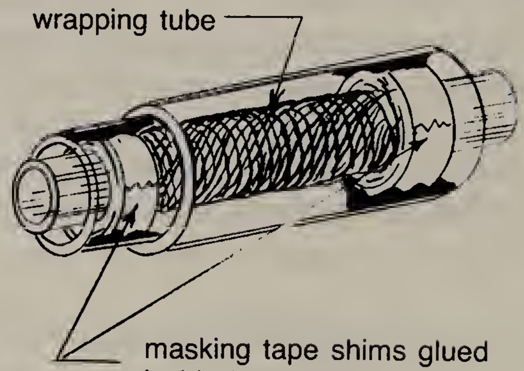


FIG. 4

FINISHED HANDLE ASSEMBLY

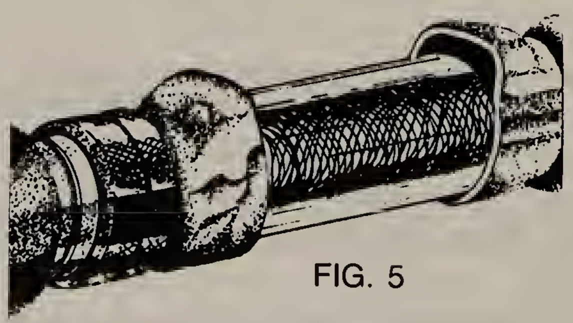


FIG. 5

Assembly sequence for an Art-Form Seat Insert.

The clear plexiglass Art-Form Inserts come as a kit consisting of the insert (Fig. 1), a wrapping tube (Fig. 2), and detailed instructions. The wrapping tube fits inside the clear insert, and in 90% of the cases is where you place your thread work or other art. The only time the tube is not used is when there is very little space between the rod blank and the inside of the insert—i.e., a large-diameter blank. In those few cases, the thread wrap is made directly on the rod blank beneath the reel seat.

The thread wrap or weave is first made on the wrapping tube, which is longer than the insert. The tube is slipped over a piece of scrap blank or dowel and the entire length of the tube is wrapped. You can extend threads onto the dowel, and no tie-down or base wraps are used at the ends, just masking tape. The wrapped tube is then color-sealed and finished in the usual manner. After the finish has cured, the tube is removed from the scrap blank and slipped inside the insert. The pattern is centered or placed exactly as desired. The ends of the insert are used as a template to mark the wrapped tube, and the tube is subsequently cut on the marks.

As in all rod building, a little planning pays big dividends. Before wrapping, temporarily place the reel-seat parts on the insert and mount the reel. Note how much of the clear center barrel is covered by the sliding hood. It is in the remaining, uncovered portion that we want to center our thread art.

Another simple point you don't want to forget: Spinning and fly reels hang under the rod and we want our art work on top, where it will not be covered by the reel feet. So, when gluing the assembly together, place the art work on the side opposite the fixed hood.

I've found that the easiest way to assemble all the parts is to first combine the wrapped and trimmed tube (Fig. 3) with the clear insert (Fig. 4). This is then glued to the skeleton reel seat, and finally mounted on the blank in the usual fashion (Fig. 5).

Even with the wrap and finish, there will still be a very small space between the wrapping tube and the inside of the insert. To fill this space and keep the tube centered, small bushings or shims are made of 1/4-inch masking tape. When these are glued, care must be taken so that no glue runs onto the face of the thread art.

To do this I first place the tube with the bushings inside the insert and push it out just far enough so that the bushing on one end is exposed. On the bushing I place five-minute epoxy, then carefully pull the tube back inside. With the glued end tipped lower, I rotate the assembly slowly in my hand for a few minutes until the glue sets.

I then tip the glued end up and apply additional five-minute epoxy all around the end of the bushing. When it sets, I go to the opposite end and apply a bead of five-minute epoxy around the other junction of bushing and inset. I can then mount the skeleton seat on the insert using slow-cure epoxy.

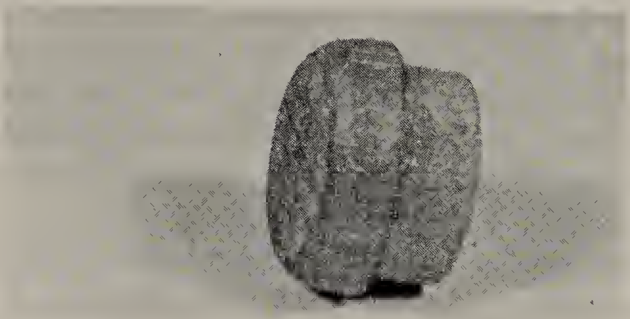
All of your clean-up of the clear plexiglass insert should be with alcohol. *Do not use* stronger solvents such as acetone, epoxy thinner, or lacquer thinner since they will etch the plexiglass. The denatured alcohol used in your alcohol lamp will do a good safe job of cleaning off uncured epoxy and degreasing all parts prior to gluing.

Initially I had some concern about wearability of the plexiglass. It was unfounded. It is much harder and more rugged than most rod builders might think. Additionally, if it does get scratched, the mark can be easily buffed out—an advantage that many of our components do not have.

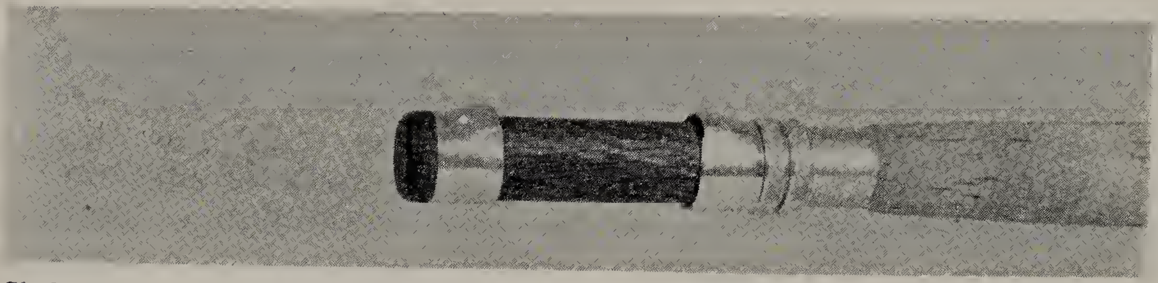
Wood-button fly-reel seat

A very handsome wood fly-reel seat with a unique appearance can be made by the use of a wood button. For this you will need a skeleton seat and a matching wood insert.

Anyone with access to a lathe can easily make one. Only a short length of solid wood, of the same type as the insert on the seat, is needed. The diameter of the largest part of the button is made exactly the same size as the wood insert in the seat. The length is generally about 1/2 to 3/4 inch. A short plug is turned on one end of the button to fit inside the fixed hood. The outside diameter of the plug is determined by the inside diameter of the fixed hood. The length of the plug should be such that it will fit about one-third of the way into the end of the hood.



Wood button to replace end cap on fly-reel seat.



Skeleton seat with wood insert and matching wood button.

Cut a narrow groove around the plug to make a better glue joint inside the hood. Use epoxy to glue the plug into the hood. When completed, the finished reel seat has the appearance of one solid piece of hardwood from the button to the insert. The fixed hood looks as if it has been inlaid into this solid piece of wood.

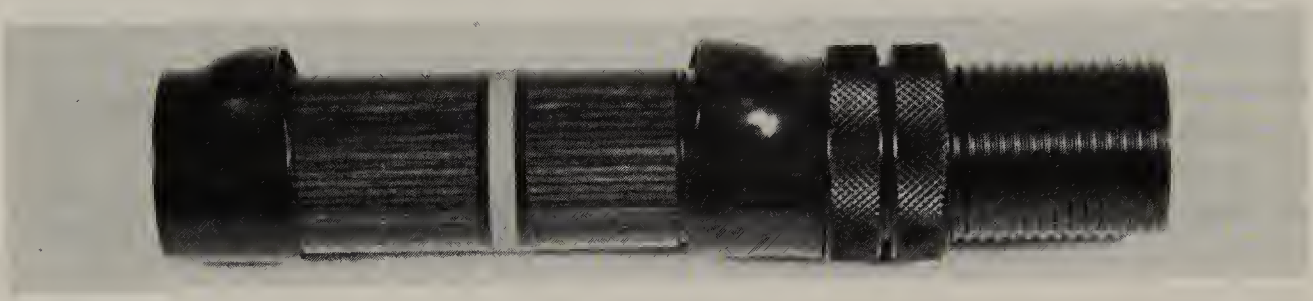
If you do not have a lathe, you can make a wood button on an electric drill. Start with a piece of wood a few inches longer than the desired finished length. Saw or plane the oversized square piece of wood into an octagonal shape by removing the corners. Locate the center *on the end that will be the plug* and insert a long wood screw partway into the wood. Cut off the screw head with a hacksaw. This provides a shaft which can be chucked into the drill. Make a tool rest of a block of scrap wood so that its height is in line with the center of the wood. Use woodworking lathe tools, or just common wood chisels, to turn the button to shape. When completed, cut off the balance of the wood screw flush with the end of the plug portion of the button.

Inlaid wood reel seats

All but one of the techniques we have been discussing for skeleton reel seats are equally applicable to spinning and fly rods. The obvious exception is the use of a wood button on the end. The only difference between a spinning seat and a fly seat is that the spinning model is larger and has both ends open for slip-over installation.

Skeleton seats with wood inserts add a distinguishing touch to practically any rod.

Custom rod builders are a creative lot, always searching for ways to improve the performance and the appearance of their rods. It is only natural that some of us occasionally go beyond the simple beauty of a wood insert in search of something unique for ourselves or a customer. These techniques have been exchanged in detail in the *RodCrafters Journal* and at our RodCrafter Seminars. I'll briefly list a few of them here to give you an idea of some of the possibilities.

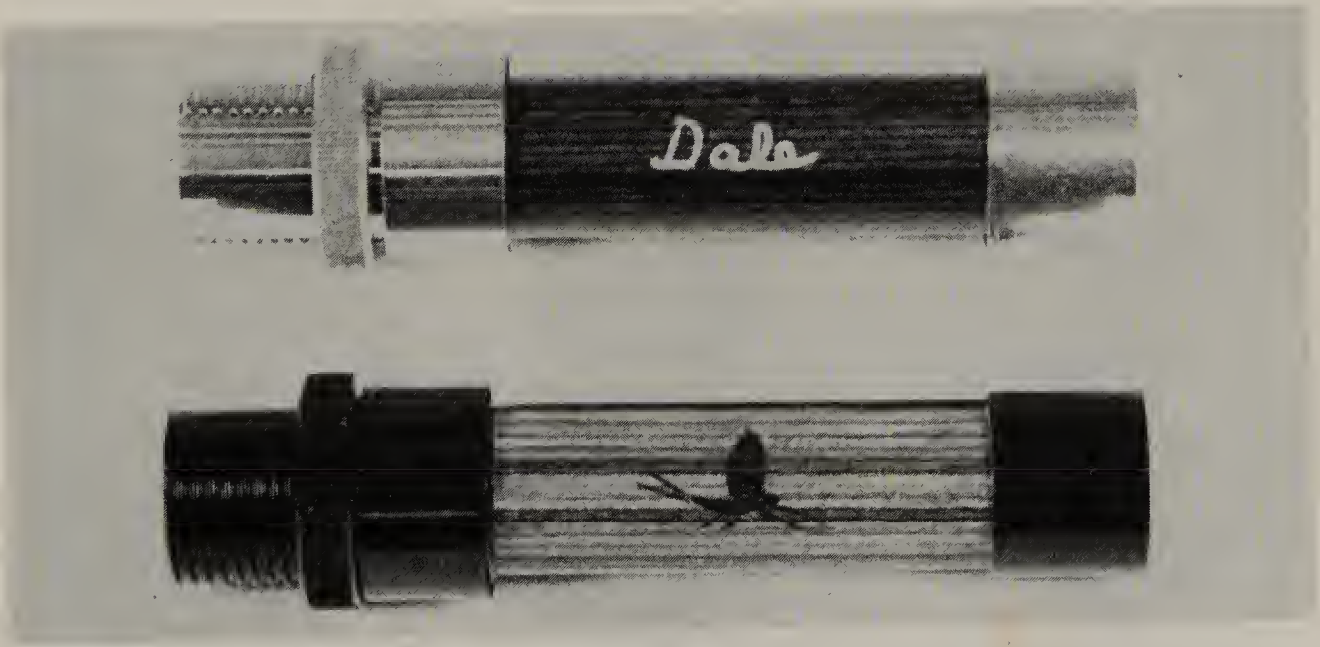


Wood seat insert inlaid with three plexiglass trim rings.

My first inlay on a wood seat insert was done many years ago and was quite simple. I placed a sandwich of three plastic trim rings—$^{1}/_{16}$-inch black, $^{1}/_{8}$-inch white, and $^{1}/_{16}$-inch black—in the center of a walnut insert, and turned it down to the same diameter as the insert. The theme was repeated on all wraps, with black-white-black narrow trim bands.

RodCrafter Ben Ritenour has inlaid wood seat inserts (and even wood grips) with straight lines that run along the axis of the rod. Straight and narrow, shallow cuts are made first in the surface of the wood. These are filled with a special epoxy to which opaque colored pigment is added. The inlays can thereby be color-coordinated with the blank, the wraps, or other components.

RodCrafter Joy Dunlap inlays the wood insert with small pieces of $^{1}/_{28}$-inch-thick contrasting wood veneer. Interesting shapes, from straight geometrics to fish to initials, are possible. Material is removed either by Dremel tool or X-Acto knife, and the veneer is



Customwood inserts inlaid by cutting a recessed groove with a Dremel tool. The upper insert is filled with silver dental amalgram: the lower insert with black-colored spackling compound.

cut by hand. When the veneer is epoxied in place, any tiny spaces resulting from mismatching cuts are filled with a mixture of sawdust from the insert and epoxy. Joy also inlays straight pieces of wood veneer called Multicolored Inlay Banding. These are various repetitive designs made of different colored woods. Using almost identical techniques, Don Gundling has inlaid abalone shell and mother-of-pearl in patterns and in a replica of an angler's signature.

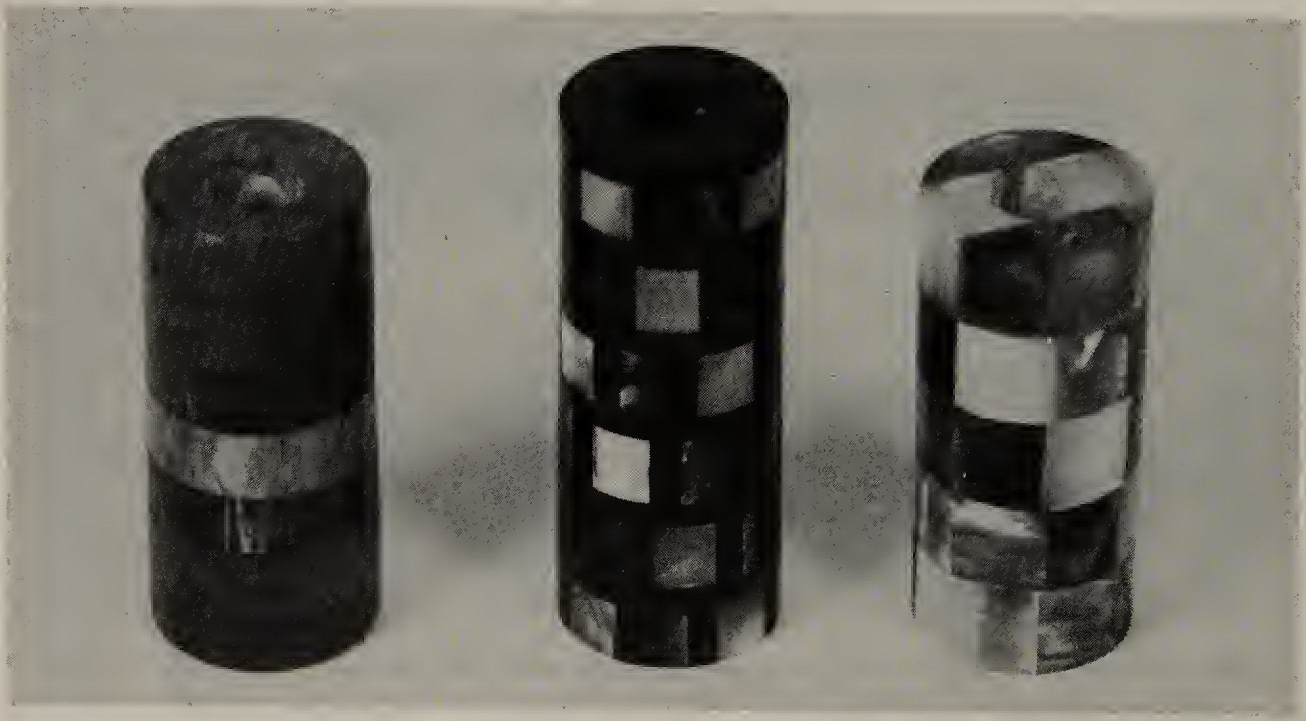
Another RodCrafter, Bill Weber, uses a technique of cutting a recessed groove or line into the wood with a vibrating electric engraving pen. The cut is relatively shallow and is subsequently filled with spackling compound. This is light in color against dark woods but can be tinted if desired (use a few drops of pigment or paint to a lump of compound). All kinds of patterns from simple to intricate are possible.

RodCrafter Jim Cost makes metallic inlays in wood reel seats. His cuts are made so that they are slightly wider at the bottom than at the top. Into this recessed cut is packed bright silver dental amalgam. If you don't have a friendly dentist (or want a less expensive substitute) you can use one of the aluminum or other bright metal paste fillers sold for repairing metals.

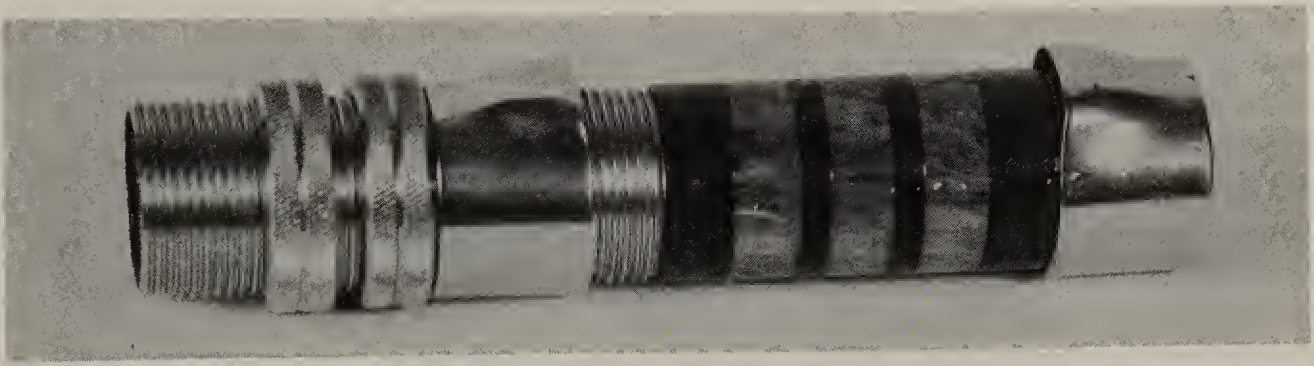
RodCrafter Jim Richardson produces a similar metallic effect without actually inlaying anything in the wood. He uses a Heat Embossing Pen and a variety of colored metallic foils. This system is most often used for inscribing the rod blank with the owner's name, and we will cover it in more detail in the chapter on wrapping finishes and finishing techniques.

With all of these techniques, it is easier to form the design or inscription on a flat surface and then transfer it to the cylindrical wood insert. First draw (or trace) the pattern on a piece of thin tracing paper. Next, tape a piece of carbon paper, followed by the tracing paper, on top of the insert. Use a ballpoint pen or pointed stylus to trace over your pattern with even pressure, thereby transferring the drawing to the wood.

Still another technique for making beautiful wood reel-seat inserts is by laminating. Pieces of contrasting woods are first carefully planed and fitted, then glued together to make the turning square. This is then bored and turned on a lathe to make the insert and bring out the pattern. RodCrafter Jack Justis does some outstanding work using this



Laminated inserts of plastic and wood made by Jack Justis.



Reel seat with laminated insert of wood and plastic.

technique. He employs not only wood and resin-impregnated wood but various kinds of plastics, combining them in handsome, eye-catching designs. The laminated theme is often repeated by Jack on a matching hosel or butt cap.

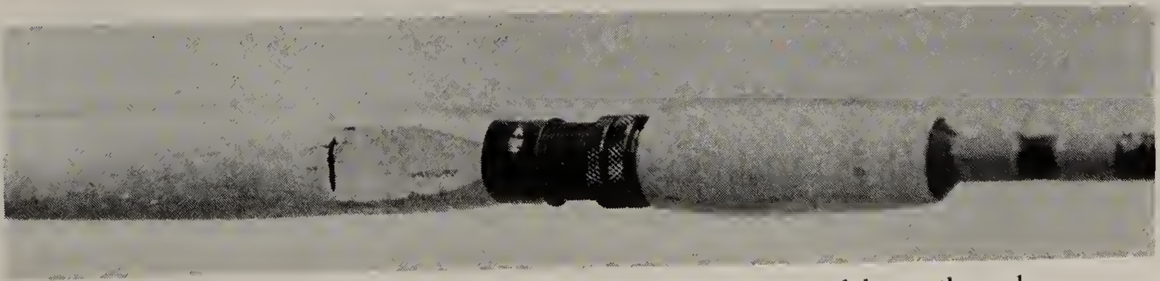
These are just some of the ways in which custom rod builders have used wood reel-seat inserts to express their creative craftsmanship.

Skeleton casting seats

Skeleton seats can also be employed on rods built for conventional revolving-spool reels. An excellent example is the type used by Pacific Northwest steelheaders. Since these rods are frequently fished in cold weather, the design was developed to place the caster's hand in touch with the maximum of cork and the minimum of cold metal. The fixed hood is completely covered with cork and is "buried" in the top part of the butt grip. The only exposed metal is the short threaded barrel containing the sliding hood and locking nuts. This is forward of the reel and therefore less likely to be held in the fisherman's hand. The cork spacer is unusual in that it is contoured to form the curved portion of the top end of the butt grip, with the rounded taper ending at the base of the threaded barrel. It is flattened on one side, flush with the "buried" fixed hood, to accommodate the feet of the reel.

To construct this assembly you can either work with preformed grips or cork rings. A skeleton fly-reel seat is the size seat to use. Let's first examine the use of preformed grip segments. The butt grip is cut square at the top end and is first taper-reamed to fit the blank. Then the hole at the upper end is enlarged so that the fixed hood will just fit inside it. Power tools work best to make this blind hole, but care must be exercised since cork is removed so rapidly. A small abrasive cylinder or piston can be chucked into a stationary drill and the grip fed into it. Or a flexible power shaft or Dremel tool can be used. The easiest way to get a perfect fit around the fixed hood is to use Terry Gibson's method, explained earlier in this chapter under *Reverse-locking fly-reel seat.*

The preformed cork spacer is made next. The outside diameter at one end should be



Skeleton casting-reel seat with fixed hood completely recessed beneath cork.

the same size as the top of the butt grip. It is then tapered and curved slightly to an outside diameter just slightly larger than the threaded reel-seat barrel. Include a tang, or reel-seat arbor, on each end that will just fit inside each of the reel-seat parts—the fixed hood on the bottom end and the threaded barrel on the top end. Fit another separate arbor for the balance of the space beneath the threaded barrel. Next, taper-ream this cork spacer and the separate reel-seat arbor to fit the blank. Carefully clamp the contoured cork spacer in a vise and file one side flat down to the diameter of the tang on each end. Check the fit of all parts assembled without glue on the blank. When satisfied with the fit, epoxy them in place, taking care to align the flat side of the spacer with the pocket in the fixed hood. After the glue dries, sand the cork to blend the surfaces of the butt grip and the spacer.

Preformed cork grips shaped for skeleton casting-reel seat. Fixed hood fits inside large hole in upper end of butt grip. Tang on shaped spacer fits inside fixed hood with flat side aligned.

The assembly can also be built of cork rings glued directly to the blank. Fit and glue the rings for the butt grip up to the point where the fixed hood will be located. Next, make a small round cork arbor to fit inside the fixed hood. It must be round so that there is space for the reel foot to slip inside the expanded pocket on the hood. Glue it onto the fixed hood, making sure no glue is on the cork surface under the pocket. When the glue dries, taper-ream the hole to fit the blank. The next step is to shape the hole of a cork ring to fit over the fixed hood. This is done with a round file. Use Terry Gibson's previously mentioned method for getting a perfect fit of the hood inside a cork ring.

Work on the cork spacer comes next. Taper-ream a single cork ring to fit the blank, but do not glue it in place. Instead, file one side of the ring flat. Remove a small amount of material at a time and keep checking the depth of your flat until it is level with the cork inside the fixed hood pocket. When it is just flush, glue the ring to the blank and to the adjacent cork surface of the end of the butt grip. This single cork ring will serve as your template for filing the flat on the other rings that make up the spacer. Taper-ream the desired number of rings and glue them to the blank.

To mount the threaded barrel of the seat, fit and glue the necessary arbors to the blank. Then glue the threaded barrel over the arbors. Now go back and file the remaining cork rings of the spacer flat on one side, using the previously flattened single cork ring as a guide. The depth of the flat side should be flush with the first ring and with the surface of the threaded barrel.

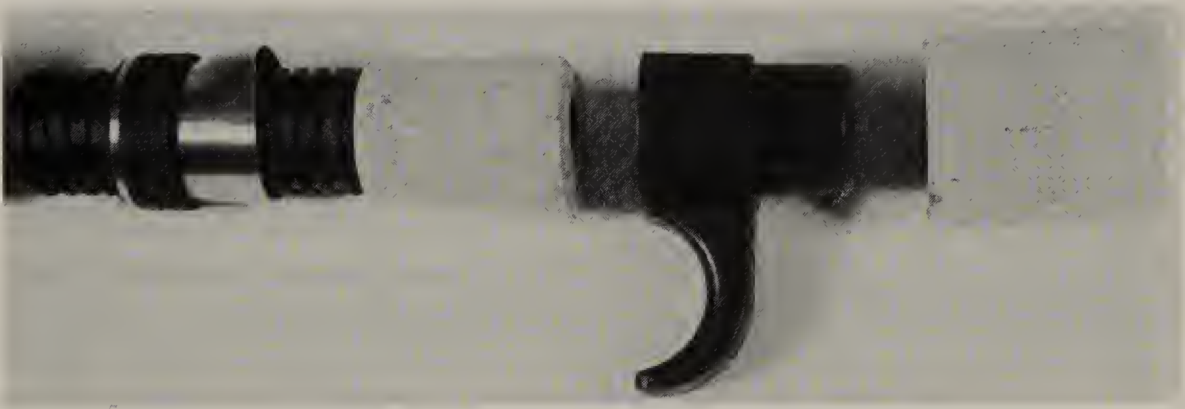
Taper-ream the desired number of cork rings to make the foregrip and glue them to the blank. When the glue dries you can shape the butt and foregrip either by hand or in a rod lathe. With some creative imagination different variations of this type of reel seat can easily be developed. Just follow the basic techniques for working with preformed segments or individual cork rings.

Trigger reel seats

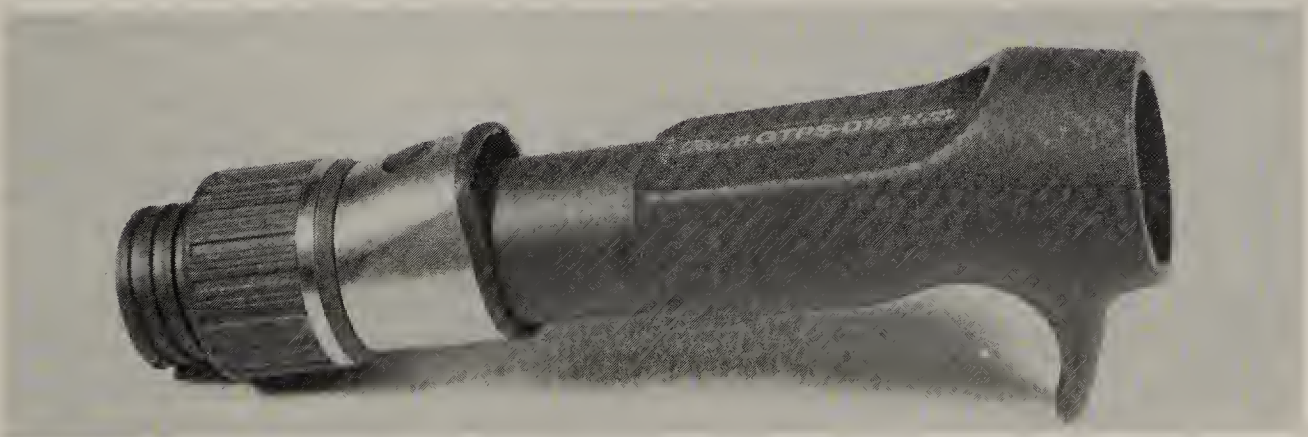
Today, more and more blank-thru handle assemblies for use with small and medium revolving-spool casting reels utilize a trigger reel seat of one type or another. Triggers are certainly not new, and the old chromed brass models were often called "finger-grip seats." They and the aluminum models which followed had one thing in common. They were uncomfortable. The trigger consisted simply of a bent strip of metal attached to the barrel of the seat. It was functional, however, for it helped the fisherman hold onto the rod during the cast and made it easier to thumb the reel spool for control.

The resurgence of baitcasting tackle for bass fishing in the '70s led to better and smaller casting reels for all kinds of fishing, from steelhead in the Pacific Northwest to specs along the Gulf coast. Existing metal trigger seats were too big, too cold in the hand, and too uncomfortable. This led to the development of a separate molded trigger by Ken Wiebe and to fiber-plastic trigger reel seats by Fuji. Both are made of graphite-filled plastic resin, which is warm to the hand even in cold weather. The companion seats are smaller and a much better fit for the downsized reels. Since they are molded, they are more comfortable—especially the smooth finger-fitting contours of the latest Fuji models.

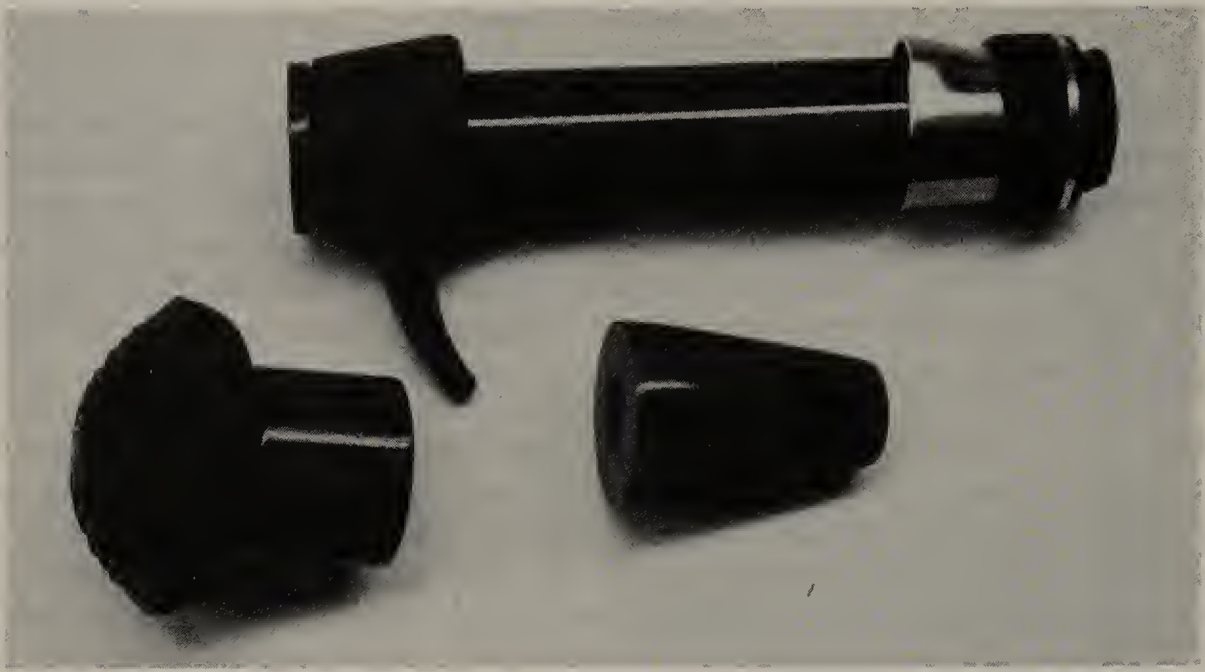
The cork skeleton steelhead assemblies just covered in *Skeleton casting seats* were first modified by the addition of the separate molded trigger. It fits inside the fixed hood of the reel seat. The top of the trigger is flat, providing a template for flattening the cork spacer. It is also possible now to purchase the trigger, reel seat, and cork spacer as a kit or sub-assembly. This allows you to fashion your own butt grip and fore grip, custom fitting them to the person who will fish the rod.



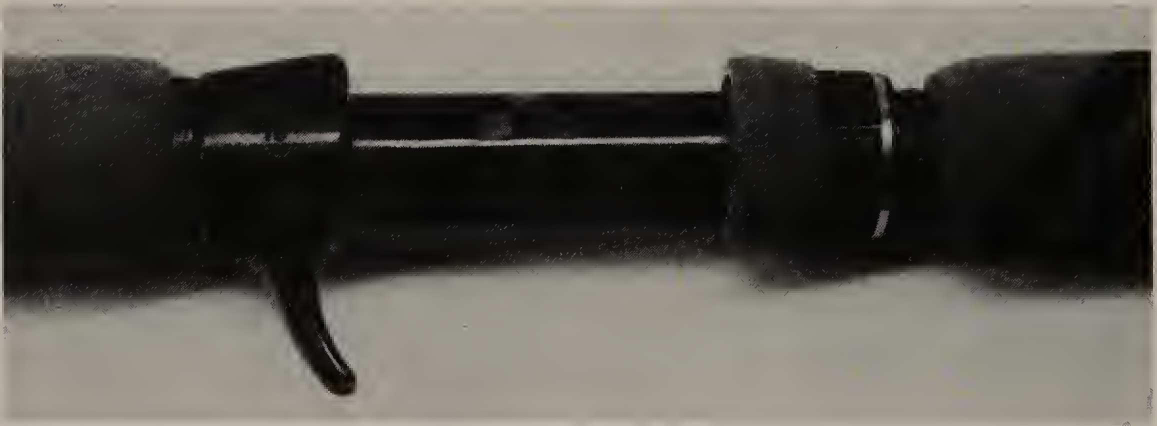
Wiebe trigger fits into the seat's fixed hood which is glued inside the cork butt grip.



Exceptionally comfortable Fuji model TPS-DI8 trigger reel seat.



Resin-impregnated wood was used by Jack Justis to customize a Fuji trigger seat and make matching butt cap and fore-hosel.



Customized Fuji trigger seat by Jack Justis. Resin-impregnated insert is inlaid with checkered plastic. Note the sliding hood covered with Customgrip II.

The easiest approach to this type of seat and handle assembly is with the new Fuji Model TPS-D16 or TPS-D18 reel seat. This graphite-filled fiber-plastic seat was specifically designed for this type of rod. It has perhaps the most comfortable fit yet designed for both trigger finger and thumb rest. No special fitting is required since it mounts on the blank the same as any reel seat.

The larger Fuji trigger seats, or the older-style models in the two smaller sizes, can be customized by making them into skeleton seats. RodCrafter Jack Justis has done this and made the inserts from resin-impregnated wood. He uses these in saltwater popping rods and in blank-thru bass rods.

Plate-type reel seats

There is a unique type of reel seat made only by Fuji that has a certain following among surf fishermen. The seat is called a plate type. It is essentially a flat plate with a fixed and a movable hood. The movable hood locks positively with the flick of a small

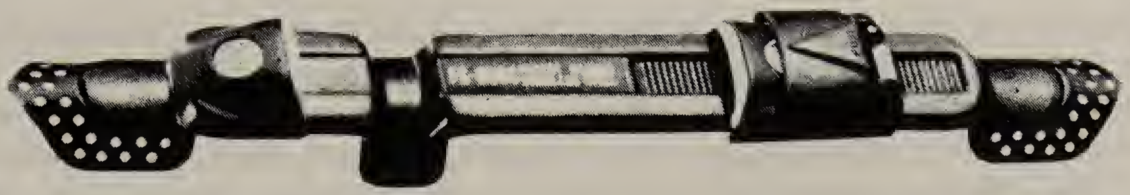


Plate-type seat by Fuji is attached to the blank by wraps of thread or tape.

lever, permitting easy mounting and dismounting of a reel. The seat has slightly curved and flared ends for attaching it to the blank. Either thread or vinyl tape is wrapped over these ends, and a similar spot near the middle of the seat.

Some surf fishermen will use lines of different strengths at different times of the year. They may also use more than one reel on the same rod. Seasonally, they may cast different weights. Because of these variables, they like to change the position of the reel. This changes the distance to the butt guide and the balance of the rod, necessary for maximum distance. All this is possible if they tape a plate-type seat on the blank. The reel can be removed from the rod after each day's fishing by merely unsnapping the movable hood. The seat itself is moved only when necessary, presumably a few times a year.

There are some surf blanks that have exceptionally large butt diameters. Sometimes a regular tubular reel seat is just not available in a large enough size. Or, if available, the seat adds too much weight to the rod. In either case, the plate-type seat is the answer. It is usually attached to the blank permanently by wrapping over the ends and the middle with thread. This is protected with color sealant and wrapping finish the same as the guide wraps.

The plate seats are made of corrosion-free stainless steel and are available in regular, black, and gold-plated finishes. Five sizes cover the range of reel-feet lengths from 2½ inches to 4½ inches.

No reel seat

No discussion of reel seats would be complete without considering the fact that some custom rods are made without any seat. Instead, the reel is taped or clamped directly onto the handle assembly. The handle can be made of cork rings, cork tape, or a hollow cylinder of graphite or fiberglass.

The reasons for building a rod without a seat are varied, with tradition in a given area often contributing greatly. New England surf rods are an example. Many fishermen there found that the older chrome/brass seats were biting-cold to the hand when wading deep in a cold surf. The graphite-filled Fuji seat is much warmer to the touch and is appearing more and more on northern surf rods. However, there are still traditionalists who cover the butt of the rod with cork tape and attach the reel with hose clamps, then figure-eight vinyl tape over that.

Down south, the Tennessee handle has long been popular on spinning rods in certain areas. The design of this handle was originally a straight cylinder of cork rings glued on the rod and turned to a comfortable diameter for the person fishing the rod. The reel is placed at whatever position balances the rod best for the angler. It is held there by vinyl or plastic electrical tape wound in a figure eight.

In recent years, a modern version of the Tennessee handle has spread to various parts of the country. It consists of a cylindrical tube of thin-wall graphite. Since it is hollow, it is exceptionally light and is at its best when used on ultralight graphite spinning blanks.

Sensitivity is essentially a factor of the stiffness-to-weight ratio, and the light graphite handle keeps rod weight low.

Usually a 10-inch length is provided. This can be shortened if desired. The handle is supported by two or three bushings. These should be reamed to fit the blank and glued in place. The cylindrical handle is then glued onto the bushings, and the butt cap and winding check mounted.

As noted on all these "no-reel-seat" handles, the reel is mounted at the point of preferred balance. This is usually done with tape, and the reel is left in place on the rod for the fishing season or perhaps for years. Another modern improvement that some like better than tape is heat-shrink tubing. Available in many diameters, a piece is slipped over the handle and over each reel foot, then heated with a blow-type hair dryer. The tubing shrinks and holds the reel tightly in place. It covers the metal feet and feels much like tape, but takes on the smooth configuration of the handle beneath it.

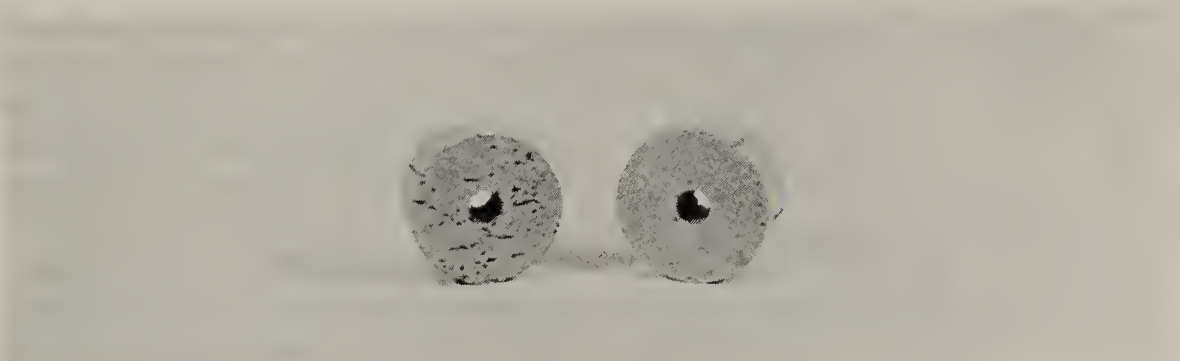
FOUR

Grips and Handles

MATERIALS FOR GRIPS AND HANDLES

Cork, the most commonly used material for grips and handles, is light in weight, firm yet slightly compressible, and easily worked and shaped. It is provided to the tackle industry in the form of rings ½ inch wide and of various diameters, with the most common size being 1⅛ inches. There are two kinds of cork rings: specie, which is cut so that the pits run parallel to the axis of the hole in the center, and mustard, which is cut so that the pits run at 90° to the axis. By far the better and stronger for grips is the specie cork. You can spot it on a grip by the frequent light wavy lines around the exterior. These are from the annular growth rings.

A number of factors determine the quality of cork rings, and it takes a well-trained eye and knowledge of cork to determine exact classification. The grades are designated by letters of the alphabet from A (the best) to E (the worst used for tackle). The primary factors of quality for the custom rod builder are density, freedom from pits, and absence of dark particles of the exterior bark.



Grade AA cork ring and regular extra-select specie cork ring.

The quality of available cork has deteriorated in recent years, and the price has risen substantially. What today is called extra-select specie cork would merely have been termed specie cork ten or fifteen years ago. Obviously, the designations for the grades have also changed. The present A grade would have been a C grade in years past. When making a grip from cork rings, the rod builder must today select and position each ring carefully. The larger-diameter portions of the grip can be made from rings of which most of the pits are near the center hole and the rim is relatively clear. Similarly, the smaller-diameter grip sections should be made of rings as free as possible of pits toward the center of the ring. On these the pits and blemishes near the outer edge of the ring will be sanded away.

Preformed grips. Most rod companies and many custom rod builders use grips that have been assembled and shaped by the cork companies abroad. These grips have the pits and holes filled with a paste made of cork dust and an adhesive, prior to the finish sanding of the grip. They are also graded by alphabetical designation reflecting both the grade of cork rings used and the quality of workmanship. Most are grades B, C, and D. When using preformed grips only light finish sanding and slight exterior fitting can be done. If more material is removed, you will expose the subsurface, unfilled pits. This will destroy the appearance of the grip or necessitate hand-filling of the new holes.

Compressed cork. This is a very poor substitute for cork grips on fishing rods. Found on only the cheapest of factory rods, it is made of small bits of waste cork that have been ground up, combined with an adhesive, and compressed in a mold. Even if finely sanded, the particles are still quite visible. It does not wear as well, does not feel as good in the hand, and is slightly heavier.

What is commonly referred to as burnt cork by rod builders has not been burned at all. It is made of special particles of dark cork that are compressed into rings under tremendous pressure. No adhesive is added. The great pressures utilize the natural resins in the cork as a bonding agent. The rings are pressed (or glued) into cork cylinders. When sanded, a beautifully even, grain-free finish results.

Cork tape. This is also a form of compressed cork. It is made of ground-up particles of both cork and rubber (or synthetic plastics). An adhesive is added and the composition is pressed into flat sheets. It resembles some common gasket materials. For the tackle industry it is provided in 100-foot rolls, 1 inch wide, with an adhesive backing so that it can be spirally wrapped around the blank.

Man-made resilient materials

Initially, the development of these materials was prompted by a need for something that would wear better than cork on heavier saltwater rods. Weight was not a primary consideration, and the early grips were considerably heavier than cork. The better ones had a good nonslip surface even when wet, and were impervious to gasoline and most common solvents. They could take far more abuse than cork, and retained their original appearance much longer. While there were various formulations, the one most remembered is Hypalon. This is a registered trade name of a product developed by DuPont, consisting of rubber and synthetic plastics and having numerous commercial and industrial applications. When extruded and ground into grips it was quite rugged but very heavy. As such, it was limited to use on heavy saltwater rods.

For a number of years, Hypalon was the only decent synthetic grip available, and there are still a few people who call all resilient grips by that generic name, even though the newer materials are entirely different. About a dozen years ago, in an attempt to reduce the excessive weight, more air was blown into the mixture when it was extruded. This continues to be available in some areas and may be called Lightweight Hypalon unless the tackle-supply company sells it under its own name. It still is quite heavy for grips and applicable only to the heaviest saltwater rods.

As the quality of cork declined while the price increased, more and more interest has been given to the development of lighter-weight resilient grip materials. This has resulted in the introduction of a number of new materials. Some proved unsatisfactory after prolonged exposure to weather, particularly the ultraviolet rays of the sun. On these the surface forms a crust which lacks resiliency and then develops cracks. Some other materials had too coarse a surface texture to start with.

Some grips, made specifically for factory rods, are not suitable for use by custom rod builders. They are generally of the ethylene vinyl acetate family, and the problem is that the hole size cannot be stretched to any appreciable degree, nor can it be reamed. If a grip is forced onto a larger blank, the material splits. Since rod companies make thousands of each model, they can specify an exact hole size to fit the blank. The material itself is available in a number of quality grades, from good to poor, with life expectancies from two to fifteen years.

Other new materials are excellent for rod builders, weighing about the same as cork. They are closed-cell (will not absorb water) with a smooth surface texture that does not become slippery even when wet. The color is consistent throughout and the material is resistant to ultraviolet sunlight.

As you would expect, there are differences in the materials. In some cases, one rod builder might rate a specific characteristic as a "minus" while another would rate the same thing as a "plus." Keeping my own prejudices in mind, I'll try to point out the major differences.

Lightweight Hypalon, as noted above, is by far the heaviest and therefore the most limited in its use. Veltex is one of the lightest and is sold under other names by various suppliers. It has the advantage of being fairly firm, with a very smooth, velvety texture. Being more firm, it stretches less and is a bit more difficult to mount. Veltex feels as if it is in the styrofoam family and has the disadvantage of accidentally cutting or tearing quite easily, as would styrofoam. Chunks will break away if subjected to very hard use, and Veltex has a high "memory," retaining dents when bumped.

There is a polyvinyl composition material sold under a wide variety of names. It is quite commonly available in southern California shops and via mail order throughout the country. Its single most identifiable characteristic is that it is quite soft and mushy. As such, it is very easy to mount since it stretches so easily. However, the softness causes an angler's hands to cramp and fatigue when it's used as a foregrip on rods meant to fight fish. Being this soft, the material will not dent but it is extremely difficult to shape on a lathe since it compresses into an oval and "rolls away" from the abrasive or cutting tool.

Customgrip II is a third-generation material specifically formulated for shaping and inlaying by custom rod builders. Both finished grips and unfinished turning squares are available. It has the desirable firmness and therefore is not as easy to mount as the soft, mushy grips. It does stretch about one and a half times its hole size, however, making it easier to mount than Veltex. It weighs about the same as cork, yet is exceptionally strong and rugged, with a smooth velvety texture.

These new lightweight, resilient grips do an outstanding job of filling the need for a cork substitute. They also present the custom rod builder with a variety of colors and a new medium for creative expression. They can be used on practically all kinds of rods with the possible exception of fly rods. Here, there is a school of anglers who feel that some of the subtle finger pressures applied to the grip when fly casting are absorbed more than would be the case with cork. Another consideration is tradition. Some fishermen prefer a fishing rod with cork grips simply because rods have always been made that way.

Wood

There was a time when hardwood, particularly straight-grained hickory, was the only material for the butts on two-piece trolling rods and boat rods. No one ever disputed the beauty of wood, but it has largely been replaced with butts of stronger aluminum. Hollow wood butts are still used on one-piece blank-thru trolling and boat rods made of solid fiberglass. Here the wood is largely cosmetic, because the extremely tough, solid fiberglass blank passes through the length of the hollow butt.

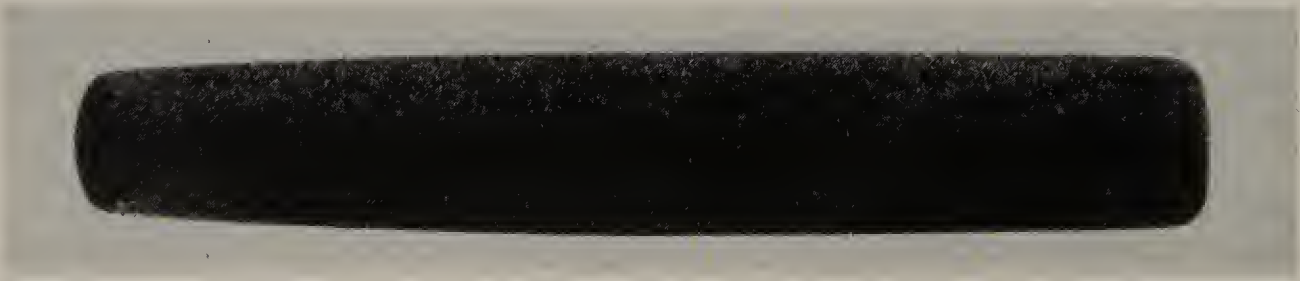
Despite the increased strength and reliable consistency of aluminum, there will always be a precious few wood butts for two-piece trolling rods. They will be lovingly crafted, one or two at a time by RodCrafters like Bert Sweetland. The beautiful butts made by Bert are laminated of dark walnut and light maple around a center core of hickory or ash.

On freshwater casting rods there has been an increase in the use of hardwood for the grip portion of the handle. Both straight and pistol grips are turned or carved to fit the caster's hand. Beautiful wood has long been popular for reel-seat inserts. Resin-impregnated wood has extended that application to custom-made Fuji skeleton seats for saltwater rods. Small pieces of wood are excellent for trim rings, hosels, and butt caps, and by every indication will be used by custom rod builders for years.

Miscellaneous materials

Flocked foregrips are very modern and plush-looking. They are made by first shaping a grip of cork to the desired size. It is then coated with epoxy and tiny, short synthetic fibers are embedded in the glue by an electrostatic process. Only the ends of these tiny fibers are embedded, so they stick out from the grip like a brush with extremely short bristles. After the epoxy cures, the fibers are so firmly anchored that they cannot be removed even by rubbing with a wire brush. Flocked foregrips have an excellent nonslip gripping surface for big-game trolling rods. They are also quite firm and will not cause hands to cramp in a long fight with a fish. The appearance is quite plush, denoting the high price of these grips.

There are two styles of flocked foregrips. Regular grips are flocked all over. Tapered have bare cork tapered ends over which thread is to be wrapped. Both styles are taper-reamed, as is any cork grip to fit the blank, then epoxied in place. Tapered models will



Flocked foregrip has an excellent nonslip surface and plush appearance.

need to have one or two coats of wrapping finish applied to the bare cork ends. After the finish has cured, it forms a smooth base over which to wrap the thread. If you try to wrap thread over bare cork you will find that it digs into the cork, and it is impossible to move the thread sideways. Unsightly gaps will be present in the wrap which cannot be burnished out. After the wrap is completed, it is color-sealed and finished in the normal manner.

There are other materials that are wrapped over shaped cork forms to make excellent, and less common, firm foregrips, most usually for saltwater rods. These include long strips of leather or vinyl and nylon cordage of various diameters. RodCrafter Jack Justis uses the same techniques to cover long, straight casting-handle grips with leather and vinyl.

INSTALLING CORK GRIPS

Cork rings can each be individually reamed to fit their respective position, and glued directly to the blank and to each other. After the glue dries, the cork cylinder is shaped into the desired grip.

Fitting each cork is most often done with a round file. The hole must not only be enlarged, but kept centered. The sides of the hole should theoretically conform to the taper of the blank. Since a cork ring is only ½ inch long, the taper over that short a length will be rather insignificant. It is therefore suggested that you file the sides of the hole so they are parallel to the outside surface of the ring. Attempting to match a taper generally results in too large a hole at one end, and a poor glue joint.

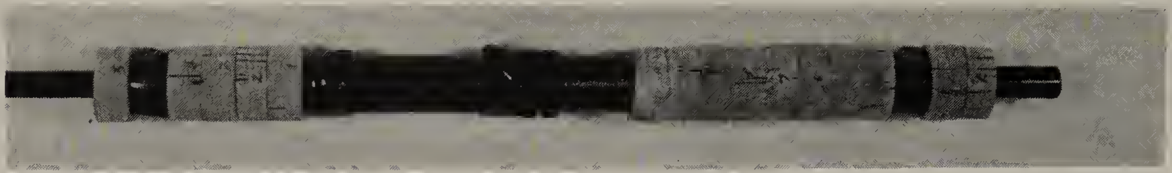
To keep the hole centered it is easiest for most people to make a reference mark on the cork, rest it on the workbench, and file horizontally. The reference mark is for turning the cork one-eighth of a rotation at a time. The same number of file strokes is made in each of the eight positions. The hole will then be enlarged evenly, and the fit should be checked on the blank. This technique is explained in detail in *Fiberglass Rod Making.*

Pattern makers have long done much of their intricate filing by moving the file vertically. Some rod builders have found the same system works well for enlarging the hole in cork rings. They work over a wastebasket to catch the cork crumbs and hold the ring low. In this way they can look down on the cork and visually keep the hole centered as they move the file up and down and move it progressively around the hole.

Many rod builders, myself included, have found that the fastest way to enlarge the hole in cork rings is with a tapered reamer. This is made of coarse cutting grit epoxied on a length of scrap blank, and we'll detail it a little later in this chapter. For reaming individual cork rings you want a reamer of sufficient diameter to fill the entire hole in the cork. Holding the ring in one hand and the reamer in the other, cork is removed rapidly as much from a twisting motion as from an in and out motion. The ring is worked up the reamer in this fashion until the hole fits the desired spot on the blank.

Regardless of the technique used to fit the rings, it is important that they be reassembled in the same sequence when actually glued. The most foolproof method is to number the corks with a felt-tipped pen. Do this while they are still in place on the blank, just after the last one has been fitted.

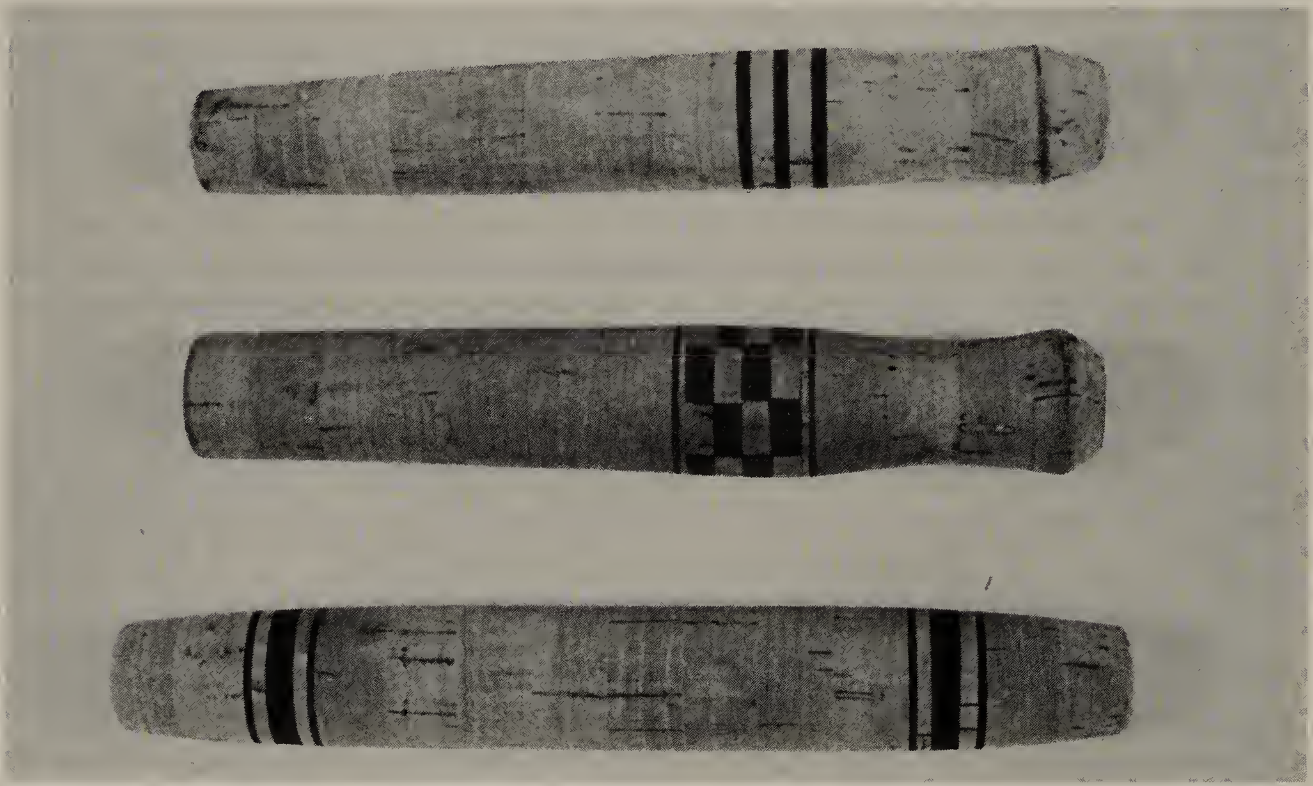
As noted in the chapter on gluing, the blank should be roughened where the grip will be glued. If you spread glue on the entire area of the blank to be covered by the grip, each cork ring slipped over the blank will scrape more of the glue away. There will not be enough glue remaining when the last corks are slipped in place. To eliminate this possibility, spread glue on the blank for only a couple of corks at a time. No glue should be



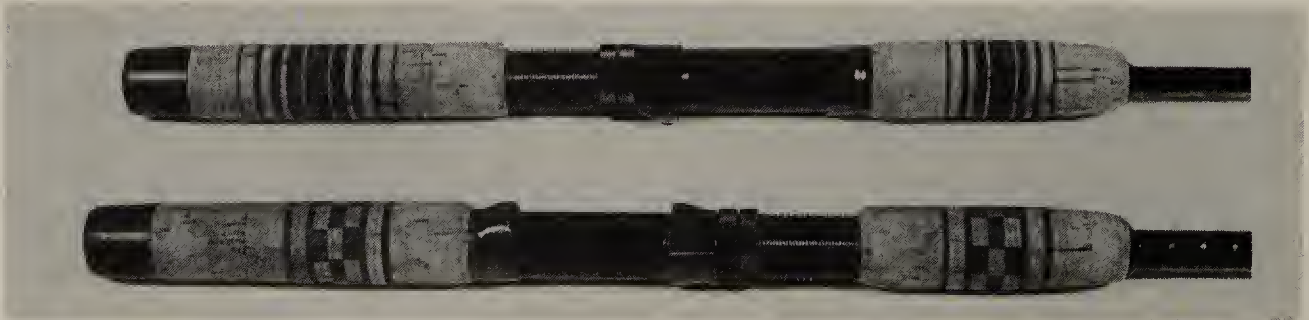
Wood and plexiglass trim rings are shaped to size before gluing on blank with cork rings. The cork is then shaped to the trim rings.

placed on the end faces of the first and last cork rings. On all others, spread an even coat of glue on both faces, making sure you have worked glue into any pits. If epoxy is used, clamping is really not necessary, but the assembly should be pushed together to seat all the rings and left undisturbed while the glue cures. If the rings do not all join evenly, clamping under mild pressure will hold them together. Evaporative cements should be clamped tightly, but will take longer to dry completely. Clamping techniques will be found later in this chapter and in the chapter on tools.

It should be mentioned here that if your handle design includes any inlays of trim rings of hardwood, plastic, or impregnated wood, as well as hosels, these pieces should



Fly-rod grips inlaid with burnt cork.



Spinning-rod handles with burnt cork inlays.

first be shaped to the finished size. They are then roughened on each face and the inside of the hole. When the individual cork rings are glued to the blank, these inlaid pieces are also glued to the blank and to the adjacent cork rings in their respective positions on the grip. When the cork cylinder is shaped to form the grip, the cork is blended into the edges of the previously sized inlays. Burnt-cork trim rings can be glued along with regular cork and all sanded at the same time.

Narrow trim rings of about 1/8 inch do not need to have the blank built up to fit a larger hole size. Wider inlays, such as 1/2 inch, with a hole size greater than the blank are best anchored by building up the blank beneath them. This can be done with epoxy and thread (or light string), or the space can be filled with a nonflowing epoxy such as PC-7. If the latter is used, it is a good idea to file a number of narrow notches or grooves along the inside of the hole with a small three-cornered file. When the epoxy cures these act like key slots to firmly anchor the trim ring.

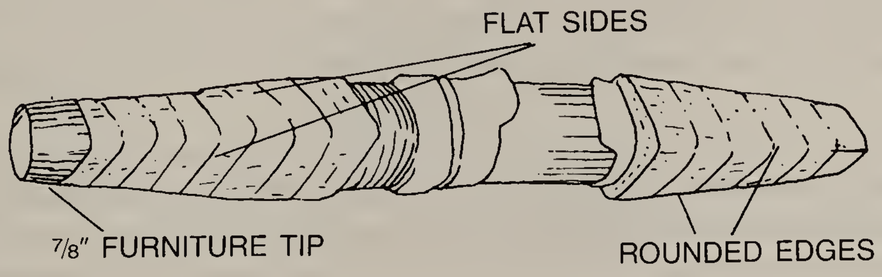
Shaping cork grips

Cork can easily be shaped by hand. It is just slower than power shaping and requires more care to keep the finished grip centered around the blank. First reduce the rough cylinder of cork rings to an even diameter slightly larger than the widest portion of the grip. If much cork is to be removed, a coarse file or rasp can be used. Cork crumbles and gouges easily, so do not use much pressure and stop considerably short of the finished diameter. If you want to play it safe, use very coarse sandpaper (50 or 60 grit) backed by a small block.

A technique which may help keep the blank centered is to first slightly flatten four sides equally. Next slightly flatten the four corners equally. You now have a rough octagonal shape. It is an easy step to round the eight corners into a cylinder. To reduce the diameter at any point further, such as on the end of a tapered grip, make a reference mark on the cork and make the same number of filing strokes for each one-eighth rotation.

When you have created the desired shape, but oversize, switch to finer-grit sandpaper (100 or 150 grit) and develop the final contours. The last bit of cork is removed with medium-fine sandpaper (200 or 250 grit). When you are satisfied with the shape and diameter, finish with extra-fine paper (300 to 400 grit).

There are some custom shapes that can only be made by hand shaping. One that is eye-catching, as well as surprisingly functional, is a tapered square spinning handle assembly. The first of these grips that I saw was developed by RodCrafter Jimmie D. York. As is often the case in custom rod work, Jimmie came up with the first model as an experiment on one of his own rods. A customer saw it and insisted on purchasing the rod. He was so pleased with it, he ordered another with the same handle design. Word got around, and soon Jimmie was building many rods utilizing this style.



Tapered square cork spinning handle.

To make the handle, first glue the desired number of rings to the blank along with the reel seat. File or coarse-sand the cork cylinder of each grip into a square shape. Next, taper the square over the length of each grip. Make the square configuration less severe and more round at the extreme butt end where the butt cap will be placed. A soft, pliable type of butt cap works best, since it will mold itself to the slightly squared-off shape. Jimmie uses 7/8-inch soft plastic furniture leg tips. The diameter of the butt cap will, of course, be determined by the amount of taper you use on the grip.

After the rough tapered square shape is made, switch to medium-grit paper backed by a small block, and smooth the four flat sides. Using the same sandpaper without the block, gently round the four edges. The degree to which they are rounded is a matter of personal preference. Finish sanding with progressively finer paper.

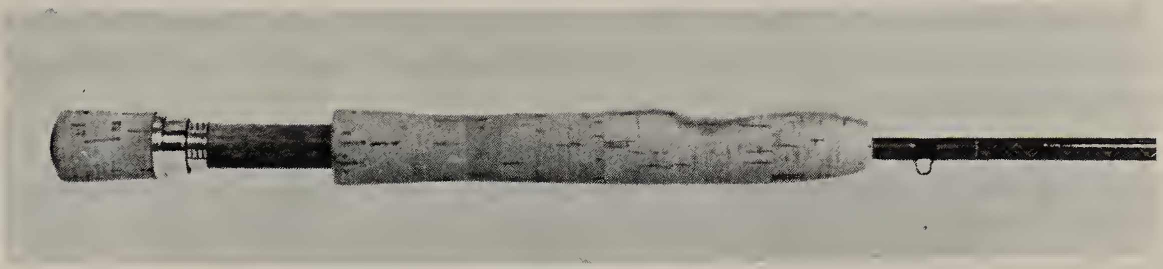
Another grip that can only be done by hand shaping is a "hammer handle" fly-rod grip. This is an extremely functional shape. One of the problems in fly casting is to keep the rod in proper alignment throughout the cast. This grip is a great aid in this regard. It is equally adaptable to a hand position where the thumb is placed on top of the grip, or one where the thumb is along the side. The shape of handles on hammers was designed long ago to permit a good strong grasp and control accuracy. These are the requirements of a fly-rod grip, and the shape is a natural. It probably has not been used more since it does not lend itself to mass-production techniques. It is also a departure from tradition, and fly fishermen are frequently the most tradition-bound members of the angling fraternity. The longer the rod and the heavier the fly line to be cast, the more applicable is the design. It has been my experience that the majority of fly fishermen prefer the grip after they have had an opportunity to fish with a rod so equipped.

To determine the shape of the grip, you only need a quality hammer as a model. Inspecting and measuring it will tell you far more than I can describe here. The techniques previously described are used after gluing the cork rings directly on the blank. Naturally, you can adjust the size to fit the hand of the person who will fish the rod.

Another grip that must at least have its final shaping done by hand is a fly-rod grip with depressions for the caster's thumb and possibly his fingers. Personally, I have become increasingly convinced that a fly-rod grip contoured to exactly fit thumb and fingers will tire a fisherman much more quickly than a fairly straight design. There is only one way a precisely fitted grip of this type can be held, and then only at one spot. Within a short time the hand cramps. Most of us in a day's fishing will repeatedly shift our grip slightly so that we are using different muscle groups. Also, without realizing it most of us move our hand forward and backward along the grip to make subtle changes in balance, again relieving hand pressure. A fairly straight grip design enables us to shift and "walk" our hand as necessary for comfort.

If you are going to make just a general depression for the caster's thumb or are going to fully contour the grip for each finger, start by shaping the general configuration. You can do this by whatever technique you normally use, be it hand shaping or power turning, but with the cork glued directly to the blank. In this type of grip the diameter is critical and should be made so that it is most comfortable for the person who will fish the rod. It really is necessary for that person to be present when the final diameter and the contours are made.

Have the angler hold the rod in his normal casting position. With a soft lead pencil, trace the outline of his thumb or fingers. Use a large round file held at an angle across the grip to make the depression. Remove only a small amount of cork at a time and constantly check the fit with the fisherman. As you near the desired depth of the contour, switch to a piece of medium sandpaper wrapped around a length of wood dowel. When the final shape is achieved, finish with a piece of fine sandpaper.

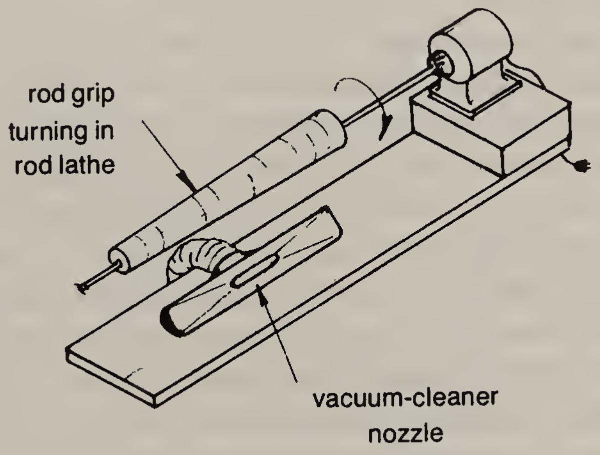


Fly-rod grip with depression for caster's thumb.

A few hints may be of help. If there is to be more than one depression or contour, work on both of them at the same time as you constantly check the fit against the caster's hand. He will be better able to feel the shape of the grip develop, and you will be less likely to remove too much cork. In general, it is better to make the contours too shallow than too deep. After the angler fishes with the rod for a while, the contours can always be made deeper. Always use a round file or dowel wrapped with sandpaper for the shaping. A few years ago one of the leading magazines carried an article on making this type of grip, and they suggested making the shape with a penknife. It is quite easy to cut too far into the cork, and also much more difficult to control the shape of the depression with a knife. Slicing cork can frequently cause it to crumble, so use a filing technique.

Grips on which the cork rings have been glued directly to the blank can also be shaped by power turning. This really is the best method for obtaining a perfectly round grip with the blank in the exact center. Various types of rod lathes can be used; you will find descriptions in the chapter on tools. Before you start turning a handle assembly, place a layer or two of masking tape on the ends of the reel seat to protect it from scratches. Power shaping will produce cork dust, which will float through the air and ultimately settle on everything in the shop. This can be eliminated by using a vacuum cleaner while shaping. Some sort of temporary or permanent support will be needed to hold the hose and a wide nozzle just below the revolving grip. A homemade support and clamp can be built from scrap wood, or the hose can be held over any convenient object with long strips of masking tape. The hose should come from behind the lathe, and it is helpful to rig an extension cord with an on-off switch to the lathe operator's position. Whenever cork is being sanded the vacuum cleaner should be operating.

When cork rings have been glued on a blank (or mandrel) to make a grip, there is always a certain amount of unevenness along with dried excess glue. The first step is to



Vacuum-cleaner nozzle picks up cork dust from shaping grips.

level the cork into a straight cylinder. This is coarse, rough shaping where it is desirable to remove material rapidly. For working freehand I suggest coarse, 40 grit sandpaper in an open coat to prevent clogging.

From the cork cylinder we start developing the basic shape of the grip. Here I use 80 grit open coat and I make the shape slightly oversize. Incidentally, if your sandpaper does not come in strips, cut or fold it into convenient widths (1 to 2 inches). This makes shaping the grip and seeing what you are doing much easier.

When making a concave curve in a grip, such as in a Half Wells (Fenwick) fly grip, bow the sandpaper strip. By pressing with your fingers on each side of the paper strip, you can cause it to bow down in a curve toward the cork. Lightly press the curved sandpaper into the revolving cork. With a little practice you will be able to control the radius of the curved bow and rock it from side to side—all to get just the shape you want. By contrast, the straight edge of a strip is much more difficult to use in making a curve.

It is a matter of personal preference whether you do all your shaping, but oversize, with 80 grit or you switch about halfway through the process to 120 grit.

Many times you will be working toward making a certain shape in a specific size. A number of techniques are helpful. One is to make a full-size drawing of the grip and have it in front of you. When you need to check measurements, you can use a pair of calipers. It is surprising how well you can do freehand just by holding the drawing next to the cork. Another method is to make your drawing on thin cardboard such as posterboard, then cut out a template. As you shape the grip, periodically hold the template against the grip until the contours match.

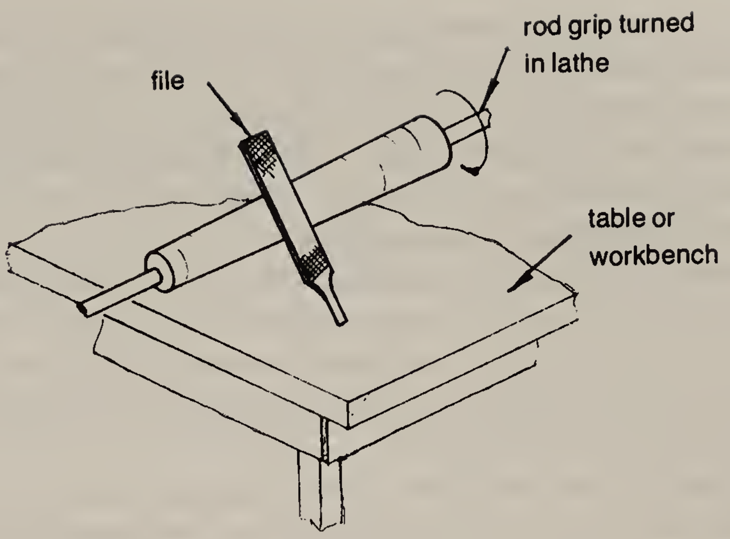
In other cases the only way to get the correct size and shape is to check the feel in the angler's hand. This means removing the rod (or mandrel) from the lathe periodically. With a fly rod that the angler will hold by the grip, it is the best way for the final fitting.

When the basic shape is completed, but a bit oversize, switch to 120 grit (fine) sandpaper if you have not already done so. This removes the coarse texture from the cork surface, leveling it, while taking the grip down to final size. Next comes finishing with 320 grit (very fine) paper. Try not to remove cork to the extent of reducing the size of the grip. Instead, use the paper lightly to make a surface smooth. If you have it available, 600 grit (extremely fine) will produce an ultra-smooth suede finish—not necessary, but nice for someone who has the touch to appreciate it.

Instead of working freehand with strips of sandpaper, some rod builders prefer to use files, mild rasps, sandpaper-covered boards, and similar tools, especially for the initial and the rough shaping. One caution I would point out is not to use any abrasive tool that is more coarse than the 40 grit open-coat paper mentioned earlier. It may gouge out chunks of cork.

When using files and similar tools, it is best not to hold the tool horizontally on top of the revolving grip. Your tool can "float" on an out-of-round grip and keep perpetuating the oval shape. More control will be obtained by resting the end of the tool on the workbench or lathe bed behind the grip. Place it far enough behind so that when the portion that will do the cutting is lowered onto the grip, the tool will be at an angle rather than vertical. Making shallow cuts, the tool can be slid along the bench and the grip in this position, and a straight cylinder of constant diameter can easily be made. Use the tool in the same fashion for precisely controlled tapers, as well as cutting recesses for butt caps, etc. Ends of grips are best rounded with finer grit, 100 to 150. While shaping, use a pair of calipers frequently to check the diameter.

Curves and contours are often made by working freehand, as explained above. Another technique is to make a number of curved shaping tools. These are quite easy to make by shaping a piece of wood to the desired curvature, coating it with epoxy, and



Rest end of file, or similar shaping tool, on bench for best control during rough shaping.

embedding cutting grit. Lengths of stock wood molding can be used, or a piece of soft wood can be shaped by hand. If such tools are made long, like a file, they can be used by supporting them in exactly the same manner as just described.

Cutting grit is available in various sizes from some rod-building-supply houses. A small quantity goes a long way. You might also purchase it locally by looking under abrasives in the Yellow Pages. Use a quality, slow-curing epoxy and spread a fairly thick coat. Lay a piece of household wax paper on your workbench. Sprinkle the grit liberally over the epoxy-coated form. When the tool is fully covered with grit, roll it under light pressure in the accumulated grit on the wax paper, and set it aside until the epoxy cures. Pour the grit remaining on the wax paper back into the container for future use.

This technique has almost limitless uses for making your own abrasive tools. Flat files of all sizes are quickly made. Curved boards of various widths and degrees of curvature can be prepared to develop any shape in a grip. Small custom sanding wheels or cylinders of different sizes are easily made to chuck into a drill or Dremel tool. One of the advantages of these tools is that if they ever become dull, they can be recharged with another coat of epoxy and cutting grit.

If you do not have a rod lathe, you can still shape your grips by power turning. In this case, instead of gluing the cork rings to the blank, you make your own preformed grips. When completed, these are taper-reamed to fit the blank. Turning is accomplished by any available powerhead, such as an electric drill. This can be held in a special drill stand or you can make your own.

A number of methods can be used to hold the cork rings, both while the glue dries and while you power shape your preformed grip. One of the simplest is a steel mandrel. Some rod-building supply houses carry these for use with their rod lathes. Another source would be from a local machine shop. It's a good idea to get a few in different diameters to match hole sizes in the cork rings you use most frequently.

Select the mandrel to fit your cork rings and first check to see if the corks will fit properly. You want a tight-press fit so that the cork will not come loose when shaping. If the fit is not tight enough, wrap the mandrel with masking tape. To prevent the glue from adhering to the mandrel or the tape, give it a coat of paraffin. Glue the cork rings to one another, allow the glue to cure, and you are ready to shape your preformed grip.

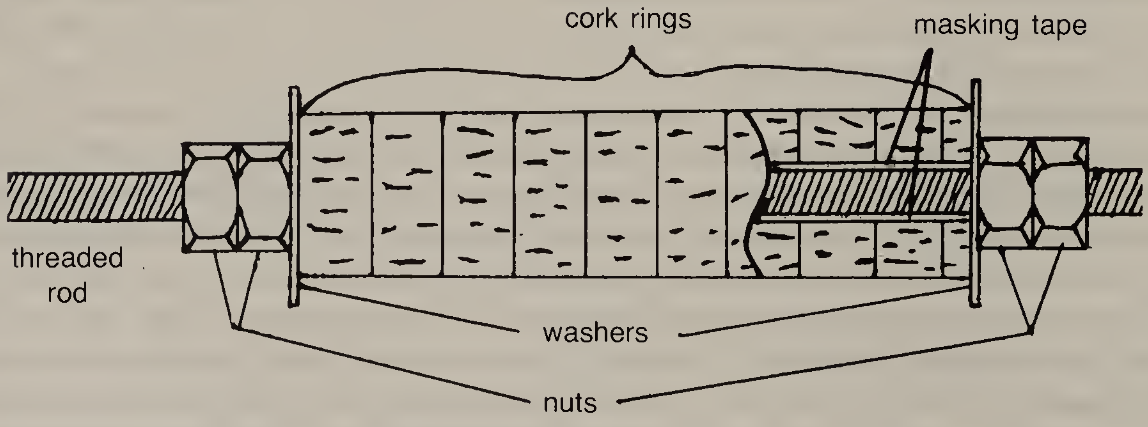
A method used by quite a few Rodcrafter Associates and explained in the *Journal* by Robert Ludke and Michael Grimshaw is the use of threaded rod as an arbor. The most commonly used size is 3/8-16, but other handy sizes to have are 1/4-20, 5/16-18, and 1/2-13. The lengths should be about 4 to 6 inches longer than the longest grip you might build. You will also need four nuts and two washers to fit each piece of threaded rod. One end of the rod will be chucked into an electric drill, so in time the threads will become damaged. Either mark that end with some paint so that you always place it in the chuck, or have one end of each rod turned by a local machine shop.

The length of rod to be covered by the cork rings is first determined, and a layer of masking tape about 1/8 inch shorter is wrapped over that section of the threaded rod. If need be, build up this layer of tape to the inside diameter of the cork rings you are using. Rub the tape with a piece of paraffin to form a moderate coat of wax. This prevents the glue from attaching the cork to the arbor.

A washer is placed at one end of the tape, followed by two nuts. From the opposite end of the rod, slide on a cork ring, seating it against the washer. Apply glue to the face opposite the washer. Each succeeding cork ring has a film of glue spread on both faces and is slid in place against the preceding cork. On the last cork, no glue is placed on the outer face; otherwise it would become glued to the washer which is placed against it. After the washer is slipped over the rod, the two nuts are added. These nuts are tightened as required for the type of glue being used. It is a good idea to wipe off any glue squeezed out to make it easier to turn the grip later.

After the glue has cured, one end of the threaded rod is chucked into a drill or other power head. If tight clamping pressure was not used while the glue dried, the nuts can be tightened more before turning. While not absolutely necessary, it is recommended that some sort of support be used for the other end of the rod. This could be a simple V-shaped block of wood of the correct height. The techniques for shaping the preformed grip are exactly the same as those discussed above for shaping a grip directly on the blank rotated in a rod lathe. When the grip is completed, it is removed from the arbor and taper-reamed to fit the blank.

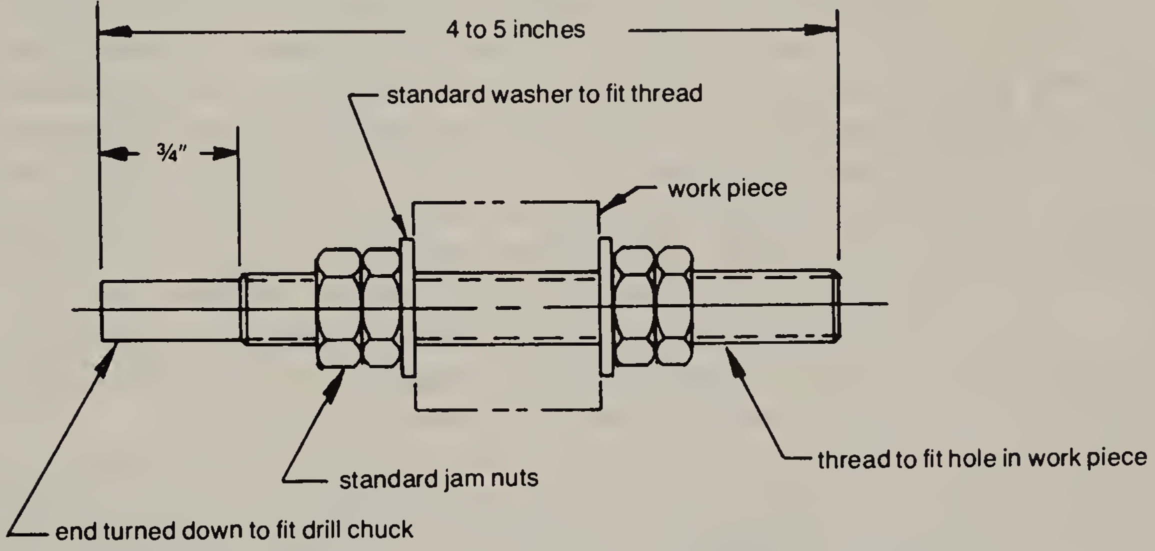
A word about the washers and finishing the ends of the grips. Some rod builders prefer to use washers at least as large as the cork rings in order to provide equal pressure and to prevent the washer from digging into the face of the cork rings on each end. If you use this approach, you cannot shape the end of each grip flush against the washer. One technique is to add one or two extra cork rings when placing them on the rod. These are to be waste cork and will subsequently be removed. The grip is shaped, including the ends, which will be located 1/4 to 1/2 inch from each washer. The final step in making the



Threaded rod is used to hold cork cylinder for shaping.

grip is to hold a sharp knife against the revolving cork at each end and cut through to the arbor.

The other approach is to use washers that are smaller in diameter than the finished size of the end of the grip. The end of the grip can then be shaped free of any interference from the washers. After the shaped grip is removed from the threaded rod, the end of the foregrip can be lightly hand-dressed with sandpaper if needed. Similarly, the end of the butt grip that has been recessed for the butt cap can be hand-dressed and any flashing trimmed away.


4 to 5 inches
standard washer to fit thread
¾"
work piece
standard jam nuts
thread to fit hole in work piece
end turned down to fit drill chuck

Threaded rod, washers, and lock nuts hold wood and plastic parts for shaping.

This same style assembly on a threaded rod is an excellent method to use to turn and shape hardwood and plastic trim rings and hosels. A shorter length of rod can be used and no end support is required. If you are combining hardwood and plastic, the setup can be used for clamping the pieces until the glue cures.

When turning these parts you will need washers smaller in diameter than the finished diameter of the piece being shaped. You will also need a tool rest. One can be made by clamping a block of scrap lumber to the workbench in front of the mounted pieces. Its height should be to the center line of the grip. If you have wood-turning chisels, fine. If not, use a regular wood chisel and shape with a light scraping action. The drill should be positioned so that the work revolves from over the top and down against the cutting edge of the chisel. The tool rest thus holds the chisel steady for precise control. Do not try to remove too much material at one time. After the desired shape or size is achieved, smooth with fine sandpaper or emery cloth.

Plastic parts and resin-impregnated wood such as Customwood can be buffed with polishing compounds, as will be explained in the next chapter. Hardwood parts should have the finish applied and dried before being glued, along with the cork rings forming the grips. In this manner you can sand the surrounding corks down to exactly the same diameter. (Protect your wood and plastic pieces during the shaping and initial sanding of the grip with a single wrap of masking tape.) If you apply the finish to your hardwood parts after the grip is completed, there is danger of staining the cork with the finish. Also, the finish adds slightly to the diameter of the wood and, if it is applied beforehand, the cork can be sanded perfectly flush.

Taper-reaming the grip

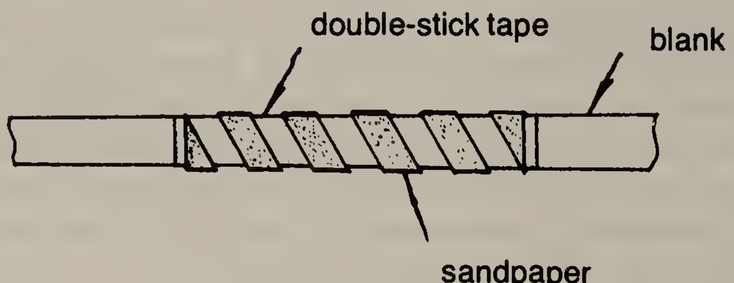
Your preformed grip with its constant-diameter hole now has to be taper-reamed to fit the taper of the blank. The most common method of doing this is with a round tapered file. If you do not attach a handle to the file it can be held by either end. This makes it easier to use either end of the file and work from either end of the grip—a definite aid in removing any high spots that develop inside the grip.

This method is described in detail in *Fiberglass Rod Making*. Briefly, it consists of placing a reference mark on each end of the grip and laying the grip on a flat work surface. The file is inserted at an angle approximating that of the blank's taper. The reference marks are used to make the same number of file strokes for each one-eighth rotation of the grip. In this manner the hole is kept centered inside the grip while it is enlarged. As cork is removed from inside the hole, the grip is repeatedly slipped over the blank to check progress and to make sure that not too much cork is being removed from one end. This is easily detected by a wobble in one end of the grip. If this occurs, remove more material from inside the other end, until the grip again matches the taper. Small amounts of cork should be removed, and frequent checks made, until the grip slides into its final position. A light scratch is then made around the blank at the upper end of the grip, and the grip is removed. The blank is roughened and coated with glue, and the grip is slipped into position with a twisting motion to spread the glue evenly.

Final fitting of preformed cork grips can sometimes be a problem. If the grip is too long to conveniently file, it can be cut into two pieces and the hole in each filed to fit the blank. The two sections are rejoined when they are glued to the blank. If the grip is cut in two, use a fine-tooth saw and place a mark across the cut. This mark is later used to perfectly align each section when it is glued.

Another problem that can occur in fitting a preformed grip when the hole has been enlarged and tapered with a file is that of one or more high spots inside the grip. These can often be removed or leveled by using a dowel wrapped with sandpaper. Another technique has been developed by RodCrafter Walter H. Wesner. He suggests using Scotch double-stick tape No. 400, and applying it to the blank *above the location* where the grip is to finally be glued. The tape is then covered with an open spiral strip of sandpaper. The combined thickness of the tape and the sandpaper determines how far above the gluing location the tape is placed. The idea is to have the outside diameter of the tape and sandpaper on the blank be the same as the outside diameter of the blank at the point where the grip is to be glued.

The previously filed grip is then slipped over the blank and slowly worked over the taped sandpaper. It is rotated in the same direction as the spiral. In the process any high spots will be removed along with the last bit of cork. As the grip is worked off the lower



Sandpaper wrapped over double-stick tape can be used to remove high spots when fitting preformed grip.

end of the sandpaper, it should form a perfect fit on the blank at the point where it will be glued. The sandpaper and tape are peeled off the blank and the normal gluing process is followed.

Sometimes aggressive use of a file on a preformed grip enlarges the very ends of the hole a bit too much. The grip as a whole may fit well, but the undisguised presence of an unsightly gap at the top end of the grip ruins everything. A number of techniques can be used. A winding check that fits the blank snugly at that point will hide the slightly larger hole. Some rod builders will first fill the hole with a mixture of cork dust and glue before installing the winding check.

RodCrafter Dan Abramson feels the best way to correct this problem, if it occurs, is to cut off the end of the grip squarely and add a single cork ring. This individual ring can be carefully filed for a perfect, snug fit on the blank. The grip and the fitted ring are glued simultaneously to the blank and to each other. After the glue has hardened the cork ring is filed and sanded to blend into the shape of the original grip. By using the preformed grip as a template of sorts, near-perfect roundness should be achieved without hazard. Dan also uses this technique to modify the appearance of a "store-bought grip" and give it a dimension of originality. These grips are already squared off at the end, although depending upon the shape desired, a bit may have to be removed.

If it is found that too much material was removed from inside a preformed cork grip at one end, it need not be discarded. To eliminate the wobble at that end and attain a proper fit, the blank can be built up slightly with masking tape or thread and epoxy. Glue is applied over this shim and the remainder of the blank where the grip is to be glued.

The rod builder who frequently works with preformed grips, either those that he buys or those he makes himself, will find it very worthwhile to acquire a set of tapered reamers. These can be purchased from supply houses or can be made by the rod builder. I would recommend that you learn to use these by hand. While we will discuss using power with tapered reamers, I feel you can go almost as fast by hand when you include set-up time. Reamers wear out fast with power and there is a certain amount of danger.

The easiest way to make tapered reamers is with coarse abrasive cutting grit and quality slow-cure epoxy glue. The grit is epoxied to a tapered mandrel made from a length of stout blank (or broken rod) or solid fiberglass boat-rod blank.

After the piece of blank has been selected, make a widely spaced spiral of masking tape over the area to be covered with cutting grit. Allow an uncoated length for a handhold, or shorter space to fit in a chuck. The tape should be 1/4 to 1/2 inch wide. If you plan to use the reamer in a power head, such as a lathe or drill, make certain you spiral the tape in the same direction that your motor rotates. Next, coat this section of the reamer with epoxy glue. The glue should not be so thin in consistency that it is runny, and the coating should be moderately thick.

Taper reamers of cutting grit epoxied to pieces of blanks.

Spread a sheet of kitchen wax paper on a flat work surface. Hold the reamer a few inches above the wax paper and liberally sprinkle the grit onto the glue-covered mandrel, rotating it for complete coverage. When the reamer is entirely covered with grit, roll it in the accumulated grit on the wax paper. This will embed the abrasive in the epoxy. Set the reamer aside, preferably by clamping the uncoated end in a vise. Wait until the epoxy has just started to set up. This usually requires about a half-hour to an hour. Then, starting at one end, carefully peel off the spiral of tape. The resultant open space provides a channel to carry away the cork dust much like the spiral grooves in a drill bit. Return the reamer to the vise until the glue has hardened completely.

As mentioned initially, it is best to have a set of these reamers of various diameters. You can then start with a size which will just fit into the hole of the grip and progressively move up to larger sizes as required. For power reaming, some rod builders prefer to mount a butt ferrule on the end of the reamer if a piece of rod blank was used. This eliminates the hazard of crushing if the chuck is tightened too much.

Reamers work best in a power head if revolved at medium to high speed. The grip must be held firmly in the hand, directly in line with the reamer. Accuracy here is important if the hole is to be straight and centered in the grip. The grip is slid onto the revolving reamer until it begins to bite into the cork. After a small amount of cork has been removed, the grip is backed off a bit to allow the cork dust to fall out and the reamer to cool. *This is important, since reaming cork generates tremendous heat, which can break down the epoxy bond. If this heat is not controlled it can also cause a piece of rod blank to disintegrate.* So work slowly, removing only a small amount of cork at a time and progressing from small-diameter reamers to larger-diameter reamers.

Tapered reamers will not in every case exactly match the taper of some blanks. There are those very occasional blanks that have a sharp "drop" in the taper where the grip is to be placed. Fortunately, there are relatively few of these. If you encounter this situation you can often easily adjust the hole in the grip with a bit of judicious hand filing, or build up the blank at one end with masking tape or thread and epoxy.

Filling the cork

All cork, no matter how good the quality, contains some small pits that will appear as the grip is shaped. On poor-grade cork some large, obvious pits may exist. These should be filled both for appearance's sake and to prevent future crumbling of the cork at the edge of the hole. Some rod builders make a practice of filling practically all pits in the surface of a grip. The best filler is a combination of cork dust obtained from *sanding* cork and Duco cement.

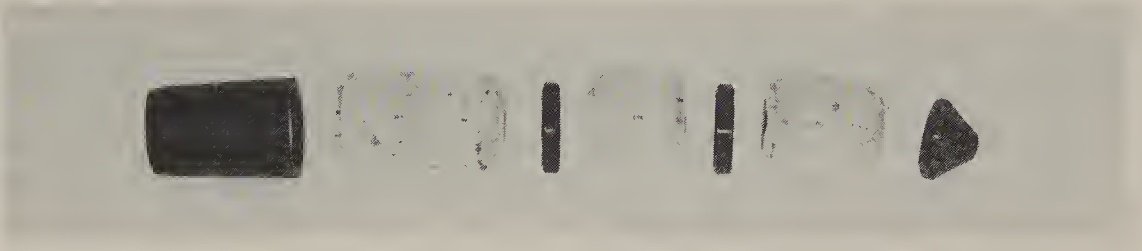
The pits should be filled *before* the final sanding with medium and fine sandpaper. Use a common dust brush to completely remove the cork dust that has settled in the pits. Unless this is done, the adhesive will not have a firm surface on which to bond and the filling will later come out of the pits. Two methods can be used. In the first, a few drops of adhesive are applied to the inside of the hole with a dubbing needle or similar tool. Then, more than enough cork dust to fill the hole is poured on top of the glue and pushed into the hole with the finger. Use a generous amount of cork dust and none of the adhesive will stick to your finger. When all the pits have been filled, lightly brush away the excess cork dust. On particularly deep holes, a second application may be needed to fill it flush with the surrounding surface.

The second method is to mix small quantities of cork dust and Cork Filler Adhesive together to form a paste or slurry. This is then pushed into the pits with a small flat stick.

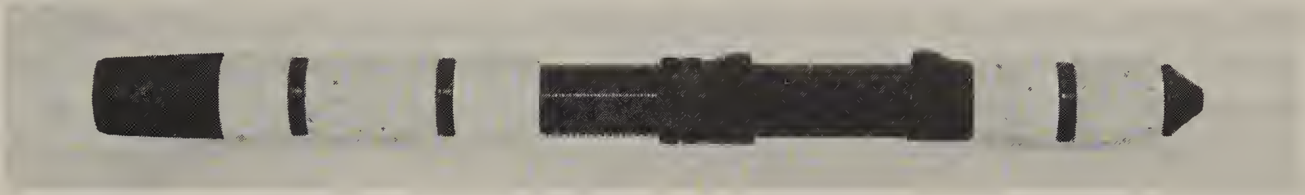
If there are many pits to be filled, make only enough of the mixture to fill a few at a time. After the glue has dried, proceed with the last bit of sanding with medium-grit sandpaper to remove any excess glue on the grip and to smooth the surface. Finish with fine sandpaper.

Modular cork handles

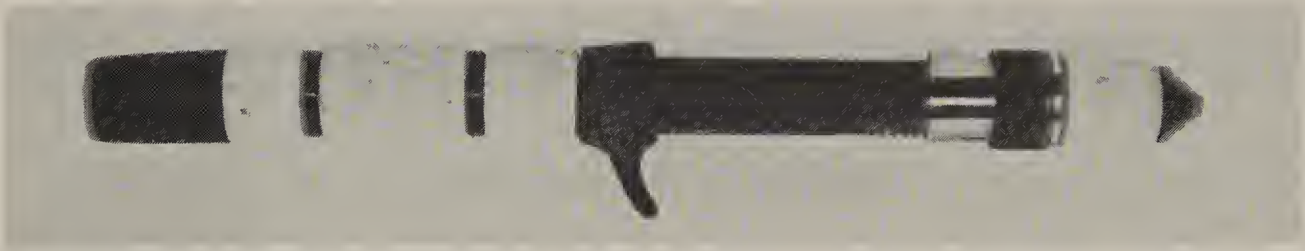
Here is a system of cork handle construction that is distinctively custom, individually color-coordinated, yet easy and fast to work with. The heart of the system is three extra-



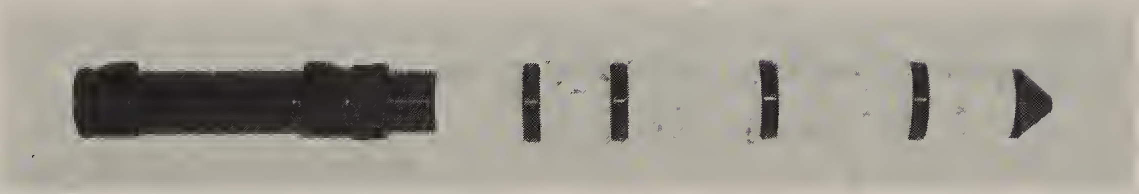
The three corks, trim rings, and winding checks of the modular cork handle system.



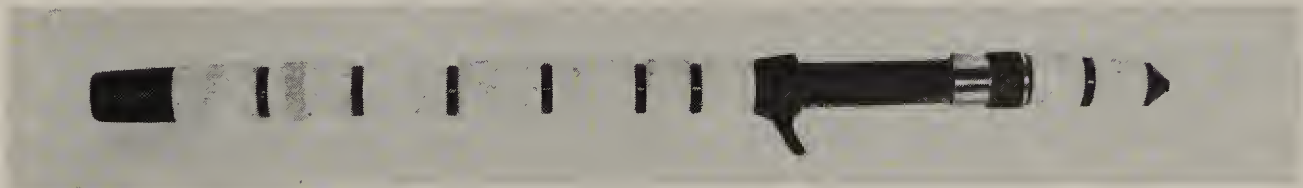
Modular cork spinning handle assembly.



Modular cork blank-thru casting handle assembly.



Modular cork fly-handle assembly.



Modular cork steelhead-handle assembly.

select specie cork pieces, completely shaped, filled, and finished. Fitting consists *only* of reaming or filing the holes to fit the blank. It is quite easy to get a perfect fit because each of the corks is short. There is none of the fitting problem associated with taper-reaming entire grips. There is a short (1-inch) straight cork, a long (1.7-inch) straight cork, and a tapered (1.2-inch) cork.

What is really unique is that each cork has a tiny tang, or bushing, on each end. Onto this tang fits a dye-receptive connecting trim ring. The outside diameter of the trim ring is slightly smaller than the O.D. of the corks, so that the ring is recessed just below the surface of the grip. With his hand on the grip, the angler does not feel the trim rings. Instead, he has a lighter, more airy feel than with a regular cork grip.

The three different corks can be combined in all sorts of eye-pleasing arrangements to make any kind of custom handle—be it spinning, steelhead, baitcasting, or fly. The long and short straight corks allow adjustments in overall grip and handle length as well as different visual effects with the trim rings. The tapered corks are used next to the reel seat for perfect contours, and at the front of the grip. The other components in the system are a dyeable winding check that is easily sized to fit any blank, and a 1½-inch-long black rubber butt cap with a cork arbor.

The trim rings and winding check can be permanently dyed using common Rit or other fabric dyes. The dyes can be mixed to obtain any color and can be stored in jars and used over and over. The longer the rings are in the dye bath, the deeper the color. Three to five minutes is the norm. Colors that complement wrapping thread are easily achieved. Another form of color coordination is to match the reel seat. For example, a black reel seat and black trim rings will give the illusion that the corks are inlaid or floating on a black core. I've also seen very good-looking handles where the trim rings were left undyed.

The system has all kinds of creative possibilities. You don't need a rod lathe or power tools of any kind and there is no shaping to be done. You can simply snap the components together off the rod in different arrangements until you find the combination that is most pleasing—then quickly fit and glue them on the blank.

Cork tape

The most common use of cork tape is on saltwater rods for surf and boat use. The tape is ideally suited to the larger-diameter blanks used for these rods. In some parts of the country cork-tape grips are also used for freshwater spinning rods. However, the smaller the diameter of the blank the less applicable is the tape. When bent around too small a radius it tends to split or crack, and the adhesive backing is less likely to hold it on the blank.

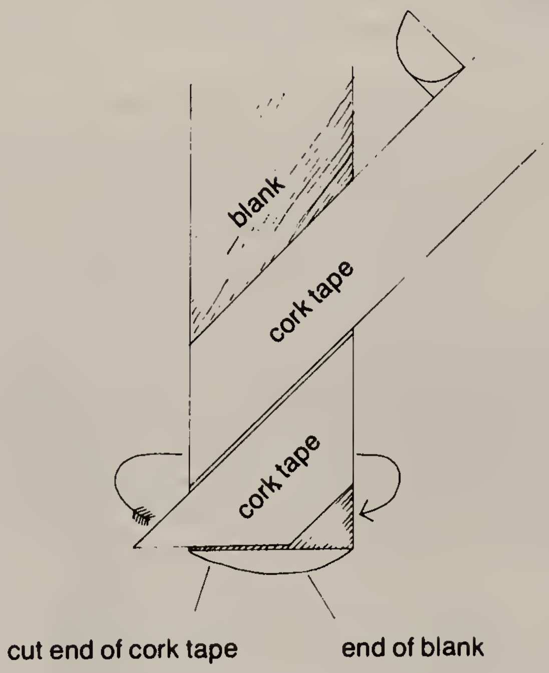
The typical handle assembly consists of a long grip with no reel seat. The reel is either clamped or taped in place where desired on the grip. Proponents of cork tape point out that the grip is rapidly made, light in weight, and has increased sensitivity since it feels as if you were holding the blank itself.

Cork tape can also be used on rods containing reel seats. Here it is normally used to cover a long butt section for two-handed casting. Regular cork or resilient grip material is used in short sections below and above the reel seat.

The tape is usually available in 25- to 100-foot rolls. To estimate the amount needed you can assume 3½ to 4 feet of tape for each foot of blank to be covered. Naturally, this varies somewhat with the diameter of the blank.

RodCrafter David Rader frequently makes saltwater rods for use in southern California waters and has written of his cork-tape technique in the *RodCrafters Journal*. From the other end of the country, Bob Dupont builds similar rods for the New England area, and has demonstrated his methods at a National RodCrafters Seminar. Both suggest that the end of the tape be cut at approximately a 45° angle depending upon the diameter of the blank on which you are working, and application started at the butt end of the blank. Peel the paper backing from only a short length of the total piece of tape.

The cut end is aligned with the bottom end of the blank, and the taper is wound in spirals at a 45° angle to the axis of the blank. It helps to use heavy-duty rod rollers or similar supports to hold the blank while wrapping the tape. It is important that each spiral of the tape butt tightly against the previous one. There should be no gap between each width of tape. Continue peeling away the backing in short lengths. Use the thumb and fingers to apply pressure over the entire surface as you wind. This brings the adhesive in firm contact with the blank, eliminating the chance of it later becoming loose or of water seeping between the blank and the tape. The technique is not difficult to master, but it is advisable to first practice on scrap pieces of blank until you get the hang of it.



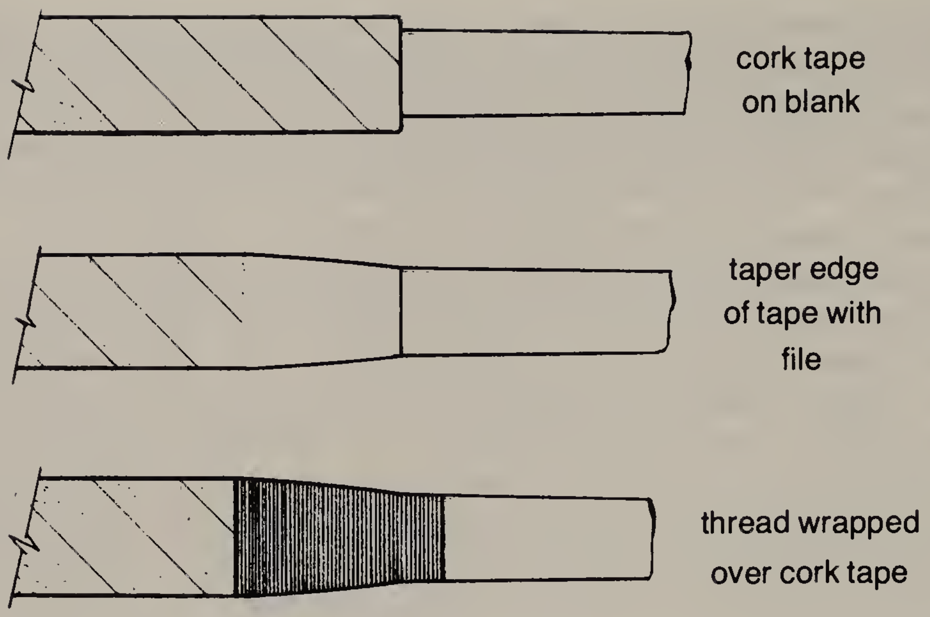
Cork tape is spiraled on blank.

After you have made the initial few spirals on the butt end, it is a good idea to wrap a band of electrician's tape around the butt to prevent it from coming loose while you are working. Later, the installation of the butt cap with epoxy glue will permanently bind the end of the tape.

When you reach the point where your grip will end, again cut the tape at an angle so that it goes completely around the blank forming a squared-off end. This end should be pressed firmly in place and temporarily held with a band of electrician's tape.

Dave favors only one layer of cork tape, while Bob builds many rods with a double layer. He feels the second layer gives a fuller appearance to the grip, offers more protection to the blank, and provides a better cushion if the reel is clamped in place. To apply a second layer on top of the first, remove the electrician's tape from the butt end and repeat the entire procedure. When applying the second layer, particularly firm finger pressure is required all along the surface for a good adhesive bond.

As noted, the butt end is finished with a butt cap. Depending upon the diameter, it



Cork tape trimmed with thread.

may be necessary to build up the grip a bit at that point to fit the butt cap. This can be done with a piece of cork tape, or with epoxy and string. The other end of the grip can be finished as desired. Some rod builders use a Turk's-head knot of nylon cord for a decorative effect. This can be finished the same as the guide wraps. Another method is to taper the end, particularly if two layers of cork tape are used, and cover it with a thread wrap which continues a short distance up the blank or merges with a decorative butt wrap. If two layers of cork tape are used, recess the second layer about $^{1}/_{8}$ inch to $^{3}/_{16}$ inch from the edge of the first layer. A coarse abrasive tool such as a file or sandpaper backed with a block can be used to taper the end of the cork.

It is almost impossible to wrap thread neatly over top of the cork tape, so a base for wrapping has to be prepared. RodCrafter Dennis Riley applies five-minute epoxy with a small gluing spatula or a flat popsicle stick. Immediately after applying the glue, rotate the rod in your hands or in a low-r.p.m. rod dryer until the glue stops flowing and has started to set. Allow several hours or overnight for the glue to cure, then sand as needed to remove flaws and even the taper. You can then wrap the taper with thread and finish with the rest of your wraps.

INSTALLING RESILIENT GRIPS

Custom rod builders are an ingenious lot, and over the years in the *RodCrafters Journal* we have probably had more articles and tips on mounting resilient grips than on any subject. The method I'll explain is the one I see most people using most successfully. Interestingly, it is also one of the simplest. If you follow it *step by step* you should never have a problem.

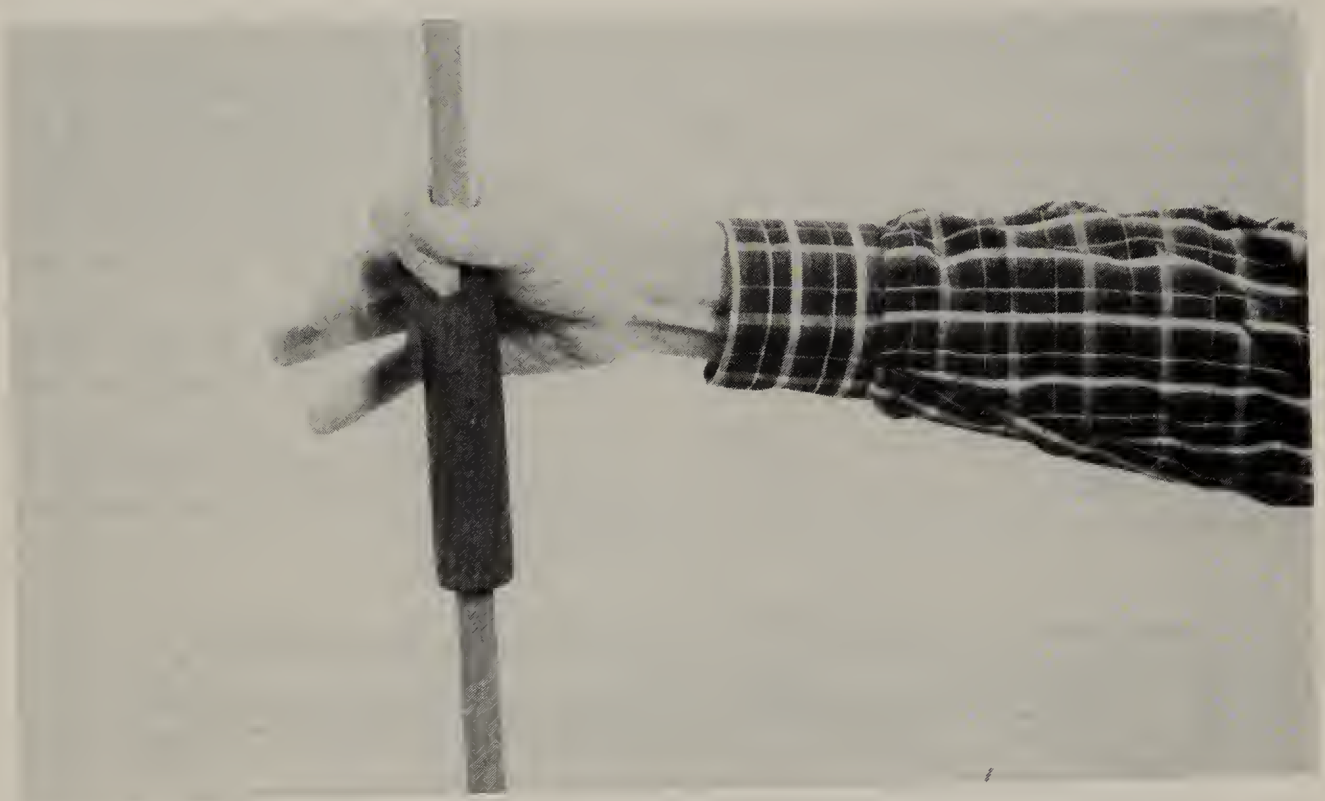
Resilient grips must be glued to the blank if you are going to have a serviceable fishing rod that will last for many years. I could recount numerous horror stories to prove my point, but let's assume you're in agreement. Slow-cure epoxy is the best glue for the job because it cures by catalytic action. Do not use evaporative cements or glues to mount a resilient grip because it's almost impossible for the solvents to evaporate from beneath the tightly fitting grip, and the glue never fully dries. We'll use the epoxy for the lubricant on which to slide the grip as well as the glue to hold it.

In preparation, place newspapers on your workbench or the floor—wherever you will rest the butt of the blank. Have some inexpensive isopropyl (rubbing) alcohol and paper towels handy, and mix a generous amount of slow-cure epoxy.

Rest the blank vertically, with the tip up, and drop the grip on the blank. Gravity alone will determine where it stops on the blank. Raise the grip so you can apply a collar of epoxy around the blank where the grip stopped. Use a small gluing spatula or a flat stick to liberally spread the glue, making the collar as long as the grip to be mounted. Spread a similar collar of epoxy about halfway down the blank and also cover the area where the grip will finally rest. Finally, spread a vertical line of epoxy along the axis of the blank between the collars.

You next want to move the grip through the first epoxy collar in order to *completely coat the inside with glue.* Move the grip down, then up, and rotate it a number of times. When you are sure the inside is completely coated, you are ready to push the grip.

The way you hold the piece of grip is very important. Do not grab it in the middle. Instead, form an "O" with your thumb and forefinger and place this around the top edge of the grip. Squeeze the end or edge of the grip only enough to form an air seal with the epoxy on the inside of the grip at that point. Push down on the grip, moving it downward on the blank in one continuous motion until it reaches the desired position.



The thumb and index finger form an "O" to seal the top edge when pushing the grip.

You will have pushed a large bead of epoxy ahead of the grip, and things will now be rather messy. Use the alcohol and paper towels to clean off the blank and the exterior of the grip. In all probability, pushing the grip will have caused it to compress in size. To correct this, grasp it with both hands, twisting each in the opposite direction while pulling the hands apart.

When the grip is back to its original length and is fully seated where you want it, stand the blank up in a corner, undisturbed, until the epoxy cures.

There are certain limitations to any hand-mounting technique. The hole in the grip should be slightly smaller than the diameter of the blank. Obviously, the smaller the hole in relationship to the blank, the more difficult it becomes to mount it. The longer the grip, the more difficult, and the thicker the walls, the more difficult. Also, as discussed earlier, the resiliency of grip materials differs.

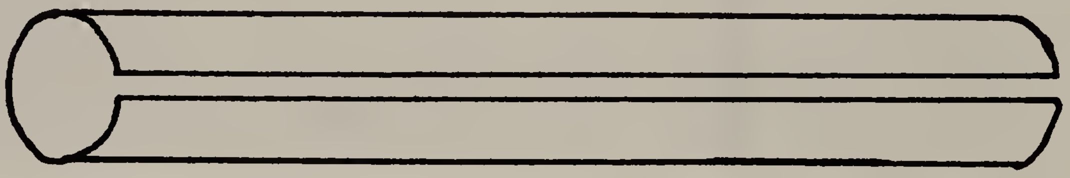
If you are faced with what you perceive to be a difficult situation, there are some things that may help. Since I am most familiar with Customgrip II, my comments are most applicable to that material. For example, on the average you can expect a grip to stretch to one and a half times its hole size without any difficulty. You can expand this range and make it easier by warming the grip in a microwave oven for *not more than two minutes*. Have everything ready and mount the grip immediately while it's warm. Do not boil the new grip materials or they will deform.

When there is a marked difference between the hole size in the grip and the blank diameter, consider switching to a larger hole size. If that isn't practical, you can enlarge the hole size in Customgrip II with a coarse-grit covered tapered reamer of the type discussed under cork grips. If the grip has thick walls, a small hole, and is not too long, you can simply hold it in one hand and use the reamer in the other hand. On long grips or those with large holes and thin walls, you will have a problem keeping the hole centered. You can inadvertently compress two opposing sides where you hold the grip in your hand while reaming. The result will be an off-center and meandering hole, and an irregular-shaped grip when it is mounted. The solution is a holder of the type designed by RodCrafter Carl Gustafson.

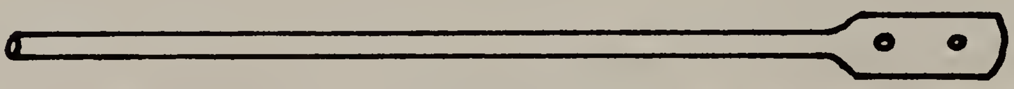
This holder is made from a piece of PVC pipe long enough to accommodate the longest grip you anticipate using and with an I.D. into which the grip will just fit. To make the holder, use a table saw or radial arm saw to cut a slot the entire length of the PVC tube. Make a number of cuts so that you enlarge the slot to at least ¼ inch wide. You can determine if you removed enough material by slipping a piece of grip into the tube and squeezing the PVC. It should clamp the grip firmly, without the edges of the slot touching. If it does not, cut the slot wider.

The holder, when squeezed, exerts an even pressure on the grip along its entire length. You can hold it in your hand or slip it in a vise or clamp. The reamed hole will remain centered.

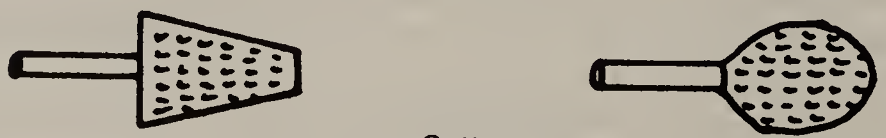
Short lengths of PVC are inexpensive. It is a good idea to get an assortment of different "schedules" (wall thicknesses) and sizes. You may be able to get them free from the discard pile of the supply house or your friendly plumber.



Holder



Drill Bit Extension



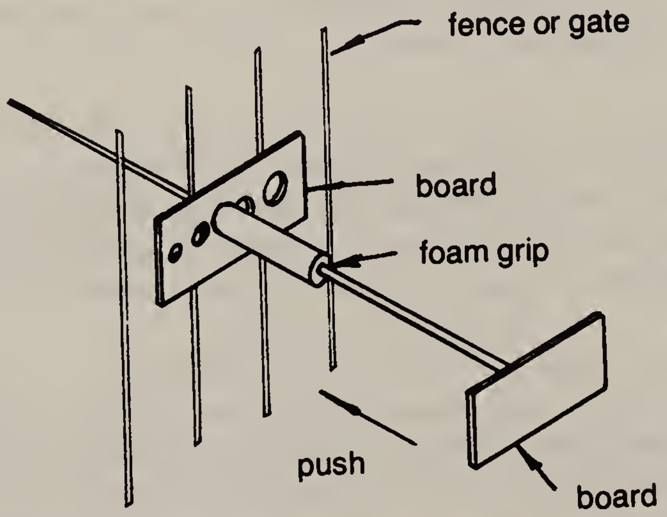
Cutters

Holder for true reaming of a resilient grip. Also drill-bit extension and cutter.

Manual reaming will work, but Carl uses power. As mentioned under cork reaming, the epoxy holding the grit breaks down from the frictional heat of power reaming. Carl therefore uses a drill-bit extension which has a hole on one end to accept ¼-inch drill bits. Instead of the drill bit, he uses various-shaped metal cutters. The conical and eliptical shapes work well because they automatically center themselves as you ream the hole.

Some rod builders find that a simple tool called a push board helps them mount resilient grips. Many years ago I first saw one used by RodCrafter Joy Dunlap. The board needs to be strong, about ½ to ¾ inch thick. It has an assortment of hole sizes bored through it. In use, a hole size is selected which will just fit over the blank at its largest diameter. This is placed on top of the grip to be mounted. The inside of the grip and the blank are lubricated with epoxy as explained earlier. Both hands grasp the push board and use it to push the grip down the blank.

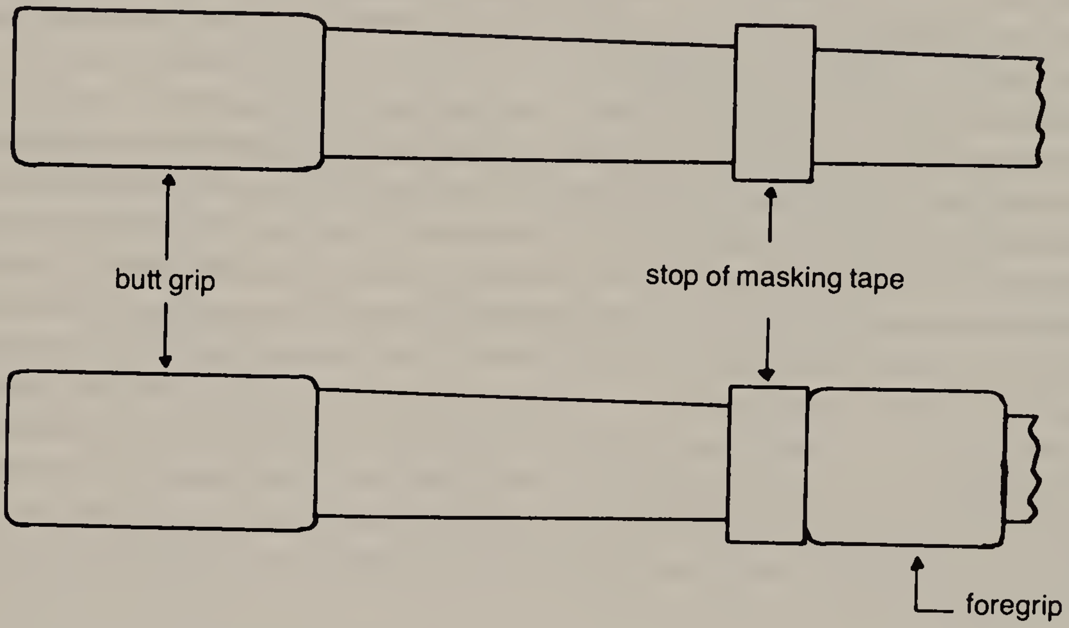
When Joy has to mount a grip with a smaller hole than desired, he uses the security gate of vertical iron bars on his shop's back door. The blank is lubricated as before and the proper hole in the push board is slipped over the blank on top of the grip. The blank is held *horizontally* and the top placed between the bars of the gate. The board is longer than the space between the iron bars. This allows the blank to be pushed through, between the bars, but the board and the grip are held stationary. Another strong board, but one without any holes, is held across the butt end of the blank and braced against Joy's chest. In this position Joy can lean against the board with a great deal of his body weight and push the blank through the bars in the gate. With a long blank he digs in his feet and walks the butt up to the grip. In the process the grip is slid along the blank to its final resting place. Lacking a security gate, you can use this technique with a strong wrought-iron fence or railing, or any similar narrow space that can be straddled by a board with a hole in it.



Mounting resilient grips. Push board with hole straddles fence and blank with grip is slipped through push board. A flat board is held against butt and weight of body is used to push butt into grip.

Regardless of the method used for mounting a resilient grip, it is necessary to have some way of stopping the grip at the desired position on the blank. In many cases, the grip will naturally come to rest at the end of the rod (against the workbench) or against the reel seat. In some situations, such as when mounting a short grip below the reel seat on a surf rod, you will need to devise a "stop." This is done by winding a number of layers of removable tape on the blank immediately below the point where the bottom of the grip is to be placed.

Split-grip surf handle design. Butt cap not yet in place.



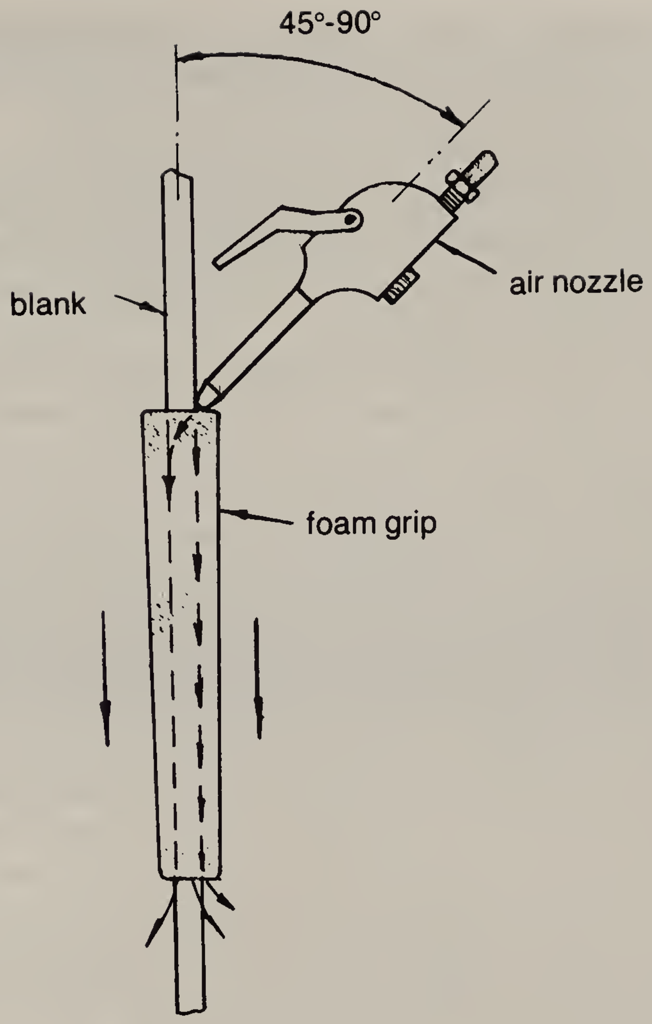
Stop of masking tape used to mount resilient grip on split-grip design surf-rod handle. After grip is in position, masking tape is removed.

Compressed air can be used to mount resilient grips with good to excellent results. If you have an air compressor with an adequate-size tank, you may want to give it a try. If you build many rods using resilient grips you may want to give serious consideration to the tool designed by RodCrafter James S. Nagao. It does a terrific job and is detailed in the chapter on tools.

Another way of mounting resilient grips with compressed air is simply to use a ¼-inch airgun with a 1/16-inch or 1/32-inch nozzle. This is not as efficient as Jim Nagao's tool so it requires higher air pressure and more flow. Depending upon how soft or firm the grip material is, it may work out just fine. Even if your shop doesn't have an air compressor, you may be able to use the one at your gas station or at a local garage.

Use a ¼-inch rubber air hose and about 125 pounds of line pressure. Place the grip on the blank and slide it down to the point where it is snug without forcing it. One hand will operate the air nozzle. The free hand can be used to hold the blank *above* the grip, or used to *very lightly* hold the grip and guide it on the cushion of air.

Put the nozzle of the airgun against the junction of the blank and the grip. The nozzle should be placed at approximately a 45° angle to the blank. Do not attempt to place the end of the nozzle into the end of the grip. Instead, keep it just against the grip and blow air down between the blank and the grip. This will slightly expand the grip and it can be floated down the blank on a cushion of air. The grip can be guided down the blank by air pressure from the nozzle alone, or the free hand can be used to *gently* guide it along the blank *without squeezing the grip*. In either case, once the grip is moving try to keep it



Compressed-air nozzle used to install resilient grips.

moving. The procedure may seem awkward at first, but with a bit of practice can be easily mastered.

A light coat of slow-cure epoxy should be spread along the blank to help slide the grip, then glue it in place.

Shaping resilient grips

The grip materials available in early years were heavy, tough, and rubbery, not at all conducive to shaping by custom rod builders. Factory-shaped grips were purchased in the size desired and mounted on the blank. If you wanted to shape your own grip, cork was the medium to use.

Some of us always felt frustrated by this inability to develop our own contours with resilient grips. When I got into the supply business, the development of a resilient material that could be shaped by the home craftsman became one of my goals. When we had a material from which we could make a custom grip, we just naturally called it Customgrip. Now, after many years and three generations of material, we have what I believe is an excellent, easily shaped and inlayable material called Customgrip II. It comes in shaped grips as well as unshaped turning squares.

For shaping any resilient grip material you will need some kind of power turning equipment. It can be a rod builder's lathe, a wood or metal lathe, or a homemade power rig. What is important is that you have adequate high-speed and/or torque on a set-up that runs true, without vibration or wobble. Since most operations will be performed on the grip before it is mounted on the rod, the space between the chuck and the tailstock need be only slightly longer than the longest grip you plan to make.

For cutting, your lathe will need to be equipped with a tool rest. This is what you brace your cutting tool against as you feed the cutting edge into the revolving grip material. If need be, you can fashion your own tool rests from blocks of scrap wood. The direction of the lathe's rotation should be such that the grip is moving down as it passes the tool rest.

The grip material needs to be held on a mandrel (shaft) for turning in the lathe. You can use strong pieces of scrap or broken blanks or straight hardwood dowels that have been varnished (the finish makes it easier to slide the grips on and off). Personally, I feel the best mandrels are steel. They are straight, strong, and run true with no vibration. Some supply houses sell them in assorted diameters, 18 inches long, and with a 60° conical hole in one end to fit a lathe's live center. I'm sure you can also get some made at a local machine shop. Incidentally, on any mandrel you use, if the inside hole on the grip material does not fit tight enough to keep the grip from turning, you can easily shim it with some masking tape wrapped on the mandrel.

Let's assume you are starting with an unshaped turning square of grip material. Cut it slightly longer than the length for the finished grip and slip it on your mandrel. The four corners can be sliced off with a blade, but knives can slip. A better method is to chuck the mandrel into your lathe and use a wood-lathe chisel to turn it round. The best lathe tool I have found for this is a skew (straight cutting edge angled at 45°). My second choice is a round-nose chisel. Surprisingly, a gouge which is used for similar rough cutting in wood turning doesn't work very well on grip material. Even a regular wood chisel can be used, as can a Stanley Surform (expanded metal) file or plane.

When the corners are removed and the material is in a rough, round shape, switch to 40 grit (coarse) open-coat sandpaper to true the material in a straight cylinder. Another excellent abrasive to use instead of the sandpaper is #60 (coarse) Sand Screen. This looks like window screening, but the filaments are covered on all sides with silicone carbide cutting grit. The open screening is impossible to clog and comes in a range from coarse to fine.

Use a sharp X-Acto blade or knife, held against the tool rest, to cut the cylinder to the grip's finished length. Shaping of the grip is done with 80 grit (medium) open-coat sandpaper or #100 (medium) Sand Screen. The final finish and surface texture of the grip is up to you. The finer the abrasive you use, the smoother the grip will become.

If you are shaping variegated Customgrip, you need to modify the shaping procedure somewhat. This is the grip material that forms a wood-grain pattern when it is shaped. It is an extruded material and therefore is round, with a tough skin on the outside which must be removed first. The best way to do this is with 20 grit (very coarse) open-coat sandpaper or #60 (coarse) Sand Screen and the generation of heat.

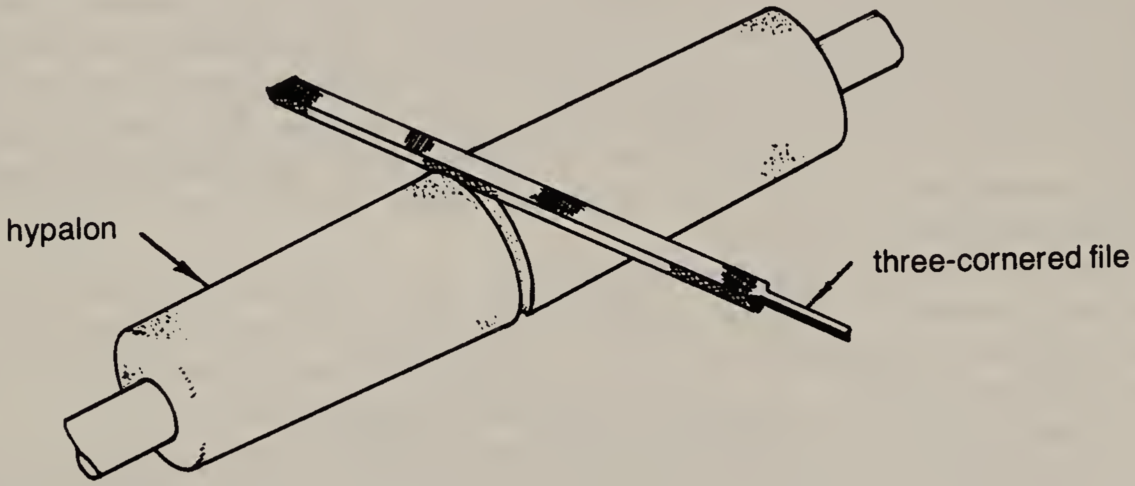
Most rod-building lathes use small sewing-machine motors. While these motors do not have a lot of power (torque) they usually have a high speed such as 5,000 r.p.m., no load. This speed is what you must use to your advantage when shaping resilient grips. Keep the speed high by not bearing down against the grip with the abrasive. Do not press so hard that you slow the motor very much. When the grip rotates lightly against the abrasive at high speed a lot of heat is generated. This is exactly what you want. When the grip material gets hot enough, it will start to be cut almost like a hot knife through butter. Only if you have a larger, more powerful motor can you bear down with the strip of abrasive.

When the outer skin is removed from the variegated grip and you have trued up your straight cylinder, switch to 60 grit (coarse) open-coat sandpaper for shaping. Final shaping and finishing of this particular grip material is best done with 80 grit (medium) open-coat sandpaper.

Solid-color grips, whether shaped by you or purchased preshaped, can sometimes benefit from some custom shaping. One method I use frequently is to make small V-grooves in the surface. These grooves form circles all the way around the grip, providing an interesting contrast to the otherwise smooth material. They look best when done in groups of three closely spaced rings. On a long butt grip I may place a group near the butt cap and another near the reel seat. The foregrip, being shorter, would have only one group.

Resilient grip with V-grooves.

I use a set of dividers whose pointed metal tips are set for the desired spacing between the grooves. The rod is mounted in my rod lathe and I use a tool rest. As the rod is revolved, the points of the dividers are carefully fed into the grip just deep enough to scribe two circles on the grip. The dividers are then repositioned so that one point rides in a previously scribed circle while the outboard point scribes the third circle.



Cutting V-groove in resilient grip.

Now that the position of the grooves is marked, I use a small three-cornered triangular file. One end is supported on the tool rest and the other on a scribed circle to enlarge the circle into a shallow groove. Next, I bend and hold a piece of coarse sandpaper over one of the corners on the file and lay it in the groove. This cuts more rapidly. When the desired depth is reached I tilt the sandpaper-covered file to each side to round off the top edges of the V-groove. The process is repeated on each of the remaining two circles to form matching grooves. The finished cuts are not very deep—just enough to be easily visible. Incidentally, this would be an ideal place to use a homemade epoxy/grit tool. It would be made just like the three-cornered file, but would cut faster.

Inlaying resilient grips

Building a better-performing fishing instrument is the primary objective of custom rod builders. When we do that, many of us want our craftsmanship and skill to be obvious enough so that someone viewing the rod knows it is custom. This means that in most cases we don't want the rod to look like a mass-produced factory rod. If it performs better, it should look better.

This desire for improved appearance over the years is what led many rod builders to decorative thread work. From diamond wraps to intricate closed-wrap patterns to small delicate weaves, all enhance the rod.

It has only been in recent years that rod crafters have had the materials with which to make their strongest custom statement—truly unique and distinctive handle assemblies. No longer does someone have to hold a rod and examine it to see that it is custom. Bold, tasteful grip inlays in colored resilient material and cork immediately proclaim that this is a custom-crafted rod.

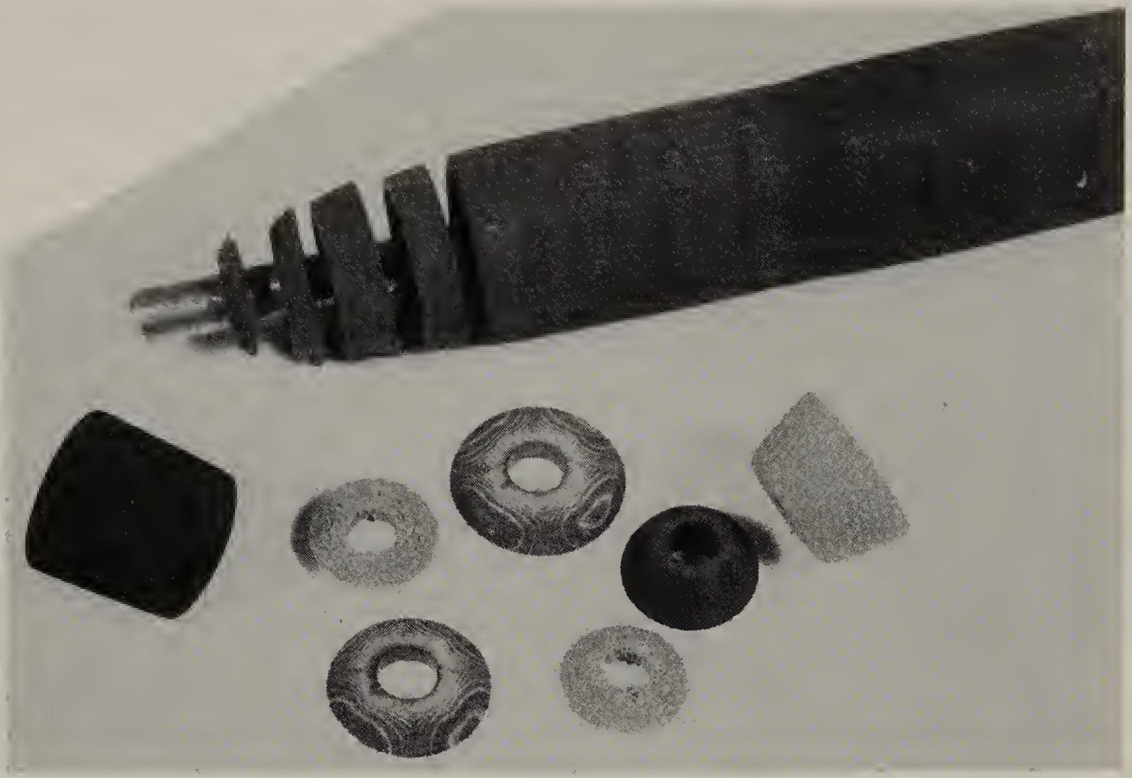
RodCrafter Glen Haynes summed it up nicely in the *RodCrafters Journal* when, in connection with the inlaying of resilient grips, he wrote: "We now have the means to make striking handle assemblies with strong, graphic impact. As such they are the perfect companions for thread weaves on the butt of the blank. There is no denying the beauty of a weave, but let's face it: weaves are small and need to be viewed up close to appreciate the skill involved. Make your easily visible, strong custom statement with an inlaid handle. Then, when an admirer looks more closely, knock his socks off with a subtle weave."

The simplest inlay and the basic building block for more complex patterns is the trim ring. To make one, turn a piece of resilient grip to a straight cylinder with a constant outside diameter. From this we can cut trim rings which are nothing more than slices. Use an X-Acto knife or similar sharp blade held on your tool rest. With the grip material rotating, feed the point of your blade into the grip until the blade touches the mandrel. Carefully measure the desired width (or thickness) of your ring and make the second cut, freeing the ring from the cylinder.

To inlay this ring in a grip of a different color, make a single cut at the desired point on the grip, separating it into two pieces. Using resilient cement, glue the trim ring between the two sections of the grip (we'll cover gluing technique below). Chuck the grip in your lathe and sand it to perfectly blend the ring into the grip.

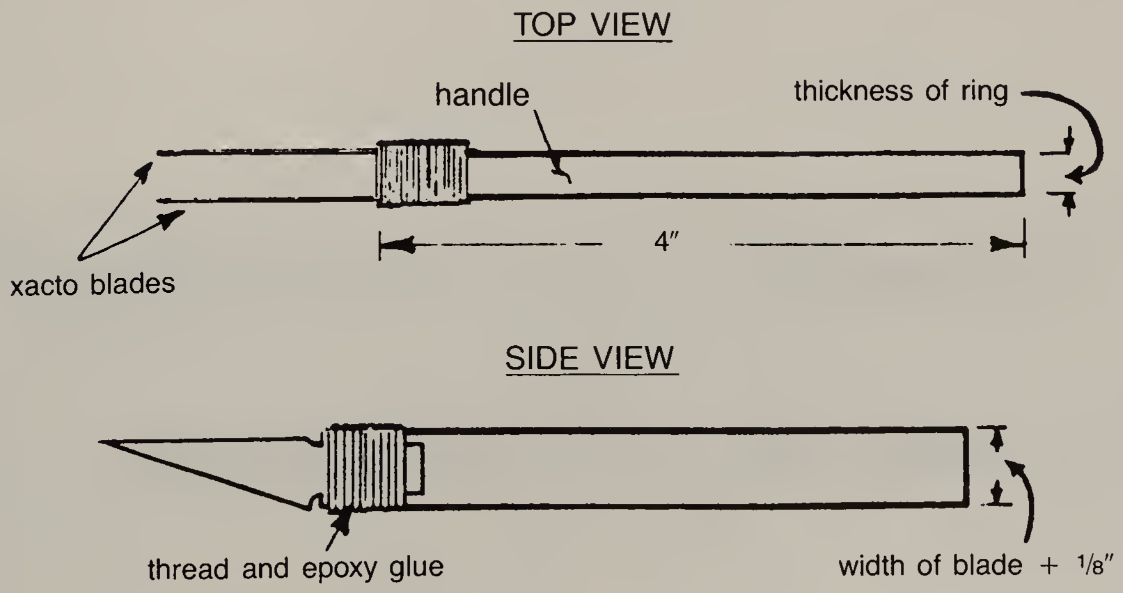
All kinds of handsome inlaid grips can be made using this simple technique. Often, instead of inlaying only one color trim ring, two colors are used. For example in a black grip, a sandwich of three trim rings, gray-red-gray, is glued. A variation might be to make the two gray rings narrower (thinner) than the red ring—or vice versa. In some cases patterns are made with rings ranging in width from extremely thin to a few inches long. All manner of possibilities exits in both pattern and color.

When just one color is inlaid into a grip, a group of three narrow trim rings often looks best. For example, a black grip with blue inlays. The narrow blue rings would be separated by two slightly larger black rings. We would therefore need to cut three narrow blue rings of exactly the same width. The two black spacer rings, slightly wider, would also need to be identical. Many other inlaid designs also would require cutting at least two trim rings of exactly the same thickness, or width.



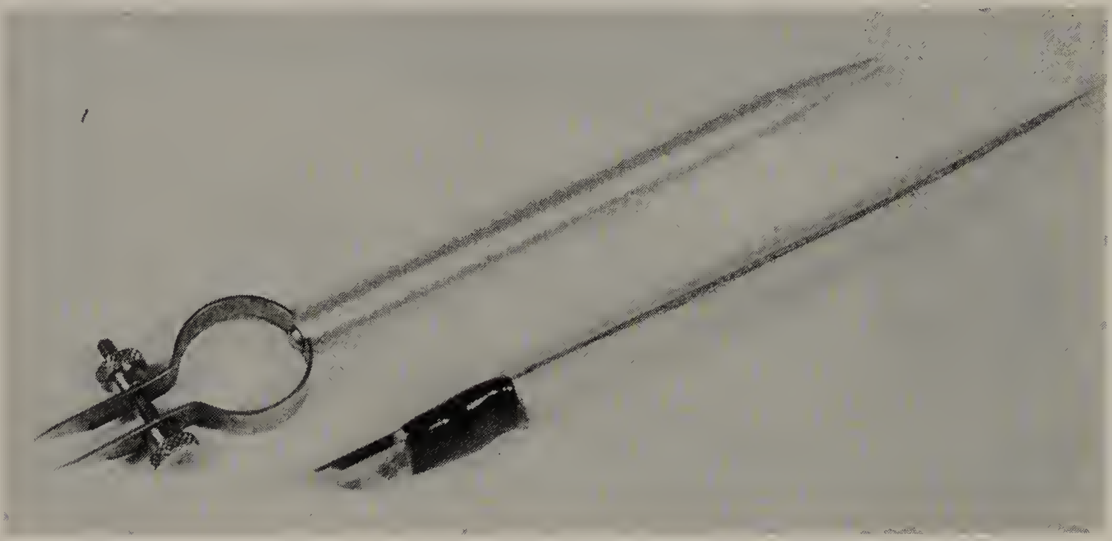
Resilient grip on a mandrel cut into various widths. The pieces in front are rounded, then sliced for use as winding checks and hosels.

Cutting perfectly matching rings entirely freehand is difficult. Some people can do pretty well with a pair of adjustable dividers with sharp points, but the easiest way by far is to use simple trim-ring knives. RodCrafter Roy Taylor makes his from pointed No. 11 X-Acto blades and various materials for handles. The handle is about a four-inch length of any hard material that is the same thickness as the trim rings desired. You can use wood, metal, masonite, plexiglass, etc. Cut the handle to a height equal to the width of the blade shank plus 1/8 inch. Two blades are attached, one on each side of the handle, by wrapping with thread. Next align the blades by pressing against a flat surface, and coat the thread liberally with epoxy glue.



Trim-ring cutter made of a wood handle and X-Acto blades.

Another RodCrafter, Bob Deshefy, is an artist. He turned to the graphic arts for a cutting tool to make trim rings. He uses a fully adjustable Bi-Cutter. The space between the two cutting blades can be varied simply by turning a nut. Some rod-building supply houses carry these.

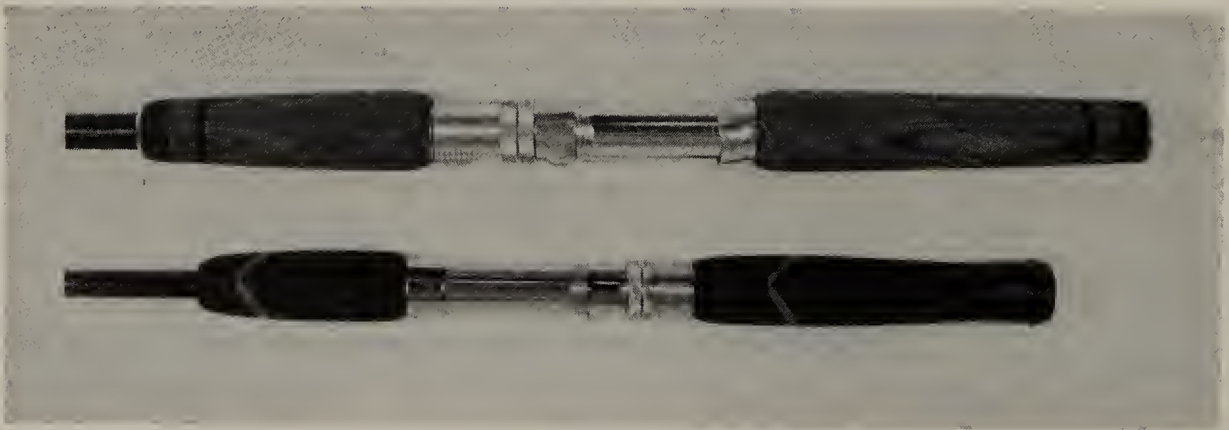


Adjustable Bi-Cutter and a homemade fixed-width trim-ring cutter.

To use any two-bladed cutter, hold it firmly aganst the tool rest and at 90° to the grip material. The cutting edges of the blades should be on top. Feed them into the revolving grip only deep enough to establish the cut, then back them out. Finish each cut with a single-blade knife. I suggest this procedure because the closer the two blades are together, the greater the chance that they will bind, kicking the tool back and ruining the ring you are attempting to make. A kickback can also be dangerous to you.

Working with tools like this and an assortment of the different colors of grip material, you can make a supply of resilient trim rings for future inlays. Holding them together in various combinations will also help you visualize inlaid grips. Cut the rings in different thicknesses and store those of the same size together in plastic bags or other containers. Often you'll want rings of only a couple millimeters' difference in size. Unless you keep them sorted, it's easy to get them mixed and it's time-consuming to sort them.

Trim rings can, of course, be inlaid in a grip of any color—even in cork (which we'll discuss later). If the grip is of the variegated (wood-grain) color you need to do a little preparatory work. The grain varies on every piece of this material, so you must cut the



Inlaid resilient grips. On the top rod, made with variegated Customgrip, note how pieces in each grip are aligned to preserve the wood-grain pattern.

foregrip and the butt grip from the same 18-inch unshaped piece. On any single grip that will be inlaid, the grip must be marked so that all the pieces can be rejoined with the grain aligned. I use a felt-tip pen for this. When the solid-color trim rings and the variegated spacer rings are glued together, it is easy to align the pen marks. Naturally, the pen marks are sanded off in the final shaping of the grip.

If you follow the proper technique you can cement Customgrip II together and not be able to see or feel the glue line. The full resiliency of the material will remain, yet it will be more than strong enough for any normal use a fishing rod would be subjected to.

Do not use epoxy glue on resilient grips. When the epoxy cures, a hard line of glue will destroy the cushion-like resiliency. When you attempt to shape the grip, the material on each side of the glue line will compress, but not the epoxy, making it impossible to produce a smooth, level surface.

The adhesive to use for resilient grips is a thin, runny contact cement which is further thinned with Crystal Flo to the consistency of pancake syrup. A thin but complete coat of this is applied to both surfaces, and they are allowed to dry. The entire gluing technique is detailed under *Gluing resilient grips* in the chapter on glues and gluing, and should be followed religiously. If it is, you'll be delighted with the results.

Working with trim rings and sections of grip, it is easy to align the pieces when gluing them together. Remember that with contact cement the surfaces bond on contact. You cannot slide or move them. Use a piece of scrap blank, broken rod, or a dowel with a diameter about the same size or slightly smaller than the hole in the grip. Slide each piece over this mandrel and carefully align it as you bring the surfaces into contact, then force them together. When all parts of the grip are joined, remove the completed grip from the mandrel.

The next step is very important. To make the cement joint really strong you must apply pressure—even if for only a fraction of a second—to squeeze the parts together. Therefore mash, pound, hammer, push, or squeeze to bring the surfaces into tight contact.

At this point you can slip the grip on a mandrel, put it in your lathe, and turn it. If time permits, I let the grip sit overnight for the bond to cure more fully before subjecting it to the heat from sanding. Incidentally, I sometimes inlay trim rings with a larger outside diameter than the grip (because that is the size I have available at the moment). The fastest way to deal with these when shaping is to first slice them off roughly flush with the grip. I use a sharp knife or a single-edge razor blade. Whenever you are doing any inlaying with resilient grip material and a piece projects after bonding, trim it flush in the same manner.

After shaping, the finished inlaid grip is mounted on the blank in the same way you would mount a one-piece preformed resilient grip. In the discussion of mounting grips it was mentioned that the longer a grip is, the more difficult it is to mount it. If you are ever faced with the need to mount an exceptionally long grip, consider cutting it into two pieces and placing a trim ring (or a two-color sandwich of three rings) between the sections. This is a technique used by RodCrafter Roy Bivens.

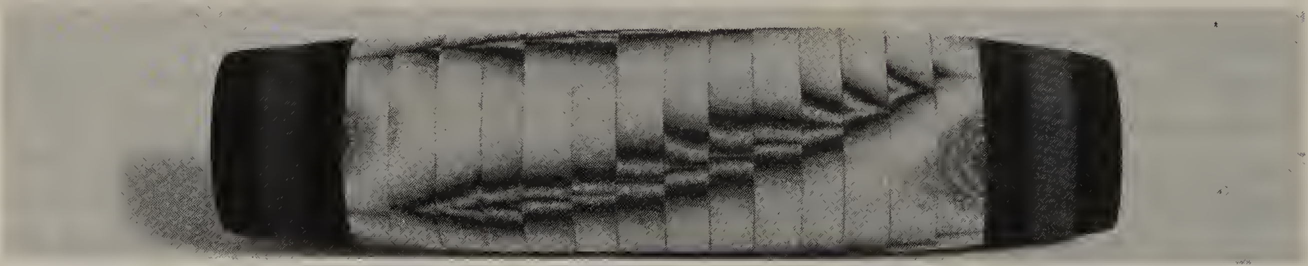
Contact-cement the trim ring(s) to the appropriate end of one of the pieces of grip. Use epoxy and mount the first piece. Clean up the worst of the mess with alcohol and apply a coat of thinned contact cement to what is now the top of the grip. Using epoxy, mount the second part of the long grip, but stop about an inch or so away from the top of the first piece of grip. Immediately clean away any epoxy from the blank and from the face of the grip that will be joined. Next, apply a thinned coat of contact cement to the face of the grip—*not* to the blank. Allow a minute or two to pass, during which the contact cement will evaporate a bit. Finally, push the second piece of grip down against the first for a resilient bond.

When you are inlaying a grip you often have a quite a few narrow trim rings, each of which has both sides covered with thinned contact cement. At RodCrafter Seminars I've often been asked what I do with these pieces while the glue is drying. I take a piece of masking tape and using cross pieces of tape at the end, attach it to my workbench so the sticky side faces up. Even very narrow trim rings will stand up on edge on the sticky tape.

Let me share another idea that has been of help to me. I think I first heard it from a high-school art teacher and I've encountered it in photographic composition and in graphic arts. I've come to think of it as simply the *Rule of Threes* and it is applicable to any design aspect of rod building. For example, a single trim ring or even a closely spaced pair do not look as good as a group of *three*. The best place on a grip or handle for the insertion of trim is usually *one third* of the distance from either end. We'll be discussing how to make checkerboard inlays below, but what generally looks best to many people is *three* rows of checkers bordered by a thin contrasting line on each end. The borders, when taken with the single overall checkerboard pattern, could also be said to form a group of *three*. A single trim ring of wood in a cork grip doesn't look as good as one sandwiched between thin plastic rings, which is a group of *three*. You can take it from there and use it whenever it helps you. I've used it in my thread work, such as a group of three single-thread inlays in guide wraps and/or hookkeeper wraps. Unfortunately, I don't always notice the application until after some things are finished.

Before we leave the technique of gluing trim rings together to make an inlaid grip, we should cover a particular pattern first made by the late Charlie Alexander, a RodCrafter who did a lot of experimenting with inlaid resilient grips. When I made two rod-building videos for 3M, I had a large assortment of inlaid grips. Everyone who visited the set was drawn to the particular pattern in question, and one fellow said, "It looks just like a feather." That's as good a name as any.

The feather grip pattern is made entirely of variegated (wood-grain) Customgrip. After the straight cylinder is turned, a felt-tip pen line is drawn the length of the material. The cylinder is then cut into slices (trim rings) all exactly the same thickness, about 1/8 to 1/4 inch. When the rings are removed from the mandrel, care is taken to keep them in their original order. Contact cement is applied and they are reassembled on a mandrel in their original sequence. The only difference is that each ring is turned a slight distance around the blank by reference to the pen line. In effect, the pen line—and the variegated pattern—slowly spirals about a quarter to a third of the way around the blank. When the glued grip is shaped by rounding the two ends, the feather pattern, or really four of them, becomes apparent.

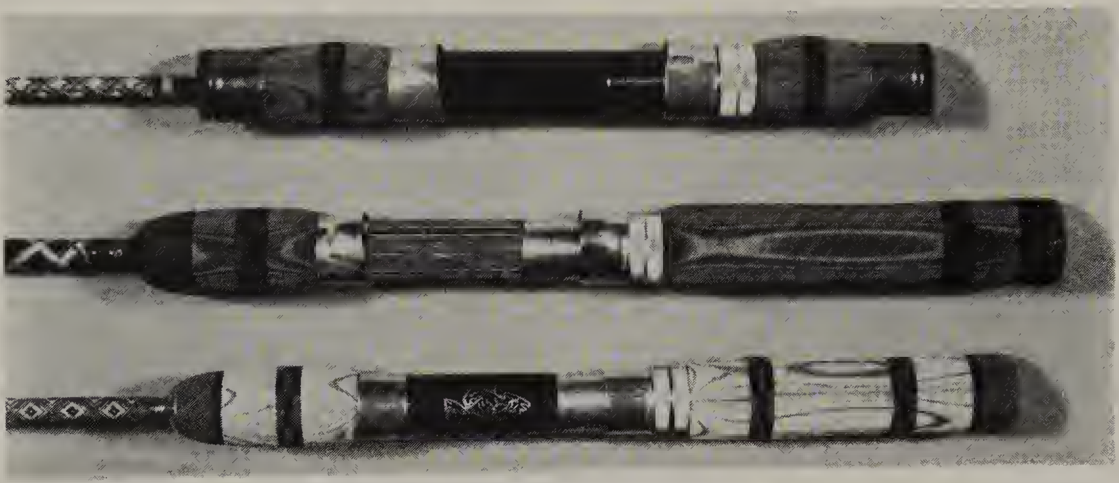


The feather pattern made by slightly spiraling slices of variegated material.

Resilient checkerboard inlays

One of the sharpest-looking inlays in a resilient grip is the checkerboard pattern. When made of three thin layers it seems to have just the right amount of intricate detail to enhance most any rod. Many variations in size, shape, and color are possible to fit a given rod or create a certain effect. Perhaps best of all from the rod builder's standpoint, the technique for making checkerboards is not difficult, especially with the tools available today.

If you were to take a checkerboard pattern apart you would find that each layer (or ring) is made up of eight alternately colored pie-shaped wedges. Each layer is offset from the one above or below it so that the two colors, as seen from the edge, produce the checkered effect. You can measure and cut these pieces by hand or you can use either one of two tools which greatly simplify and speed up the operation. The tools take slightly different approaches, but neither is any better than the other. It's solely a matter of personal choice.



Variegated resilient grips with checkerboard inlays. Note also the wood stripe inlays in the center reel seat and gold metallic fish embossed with a heat pen on the bottom seat insert.

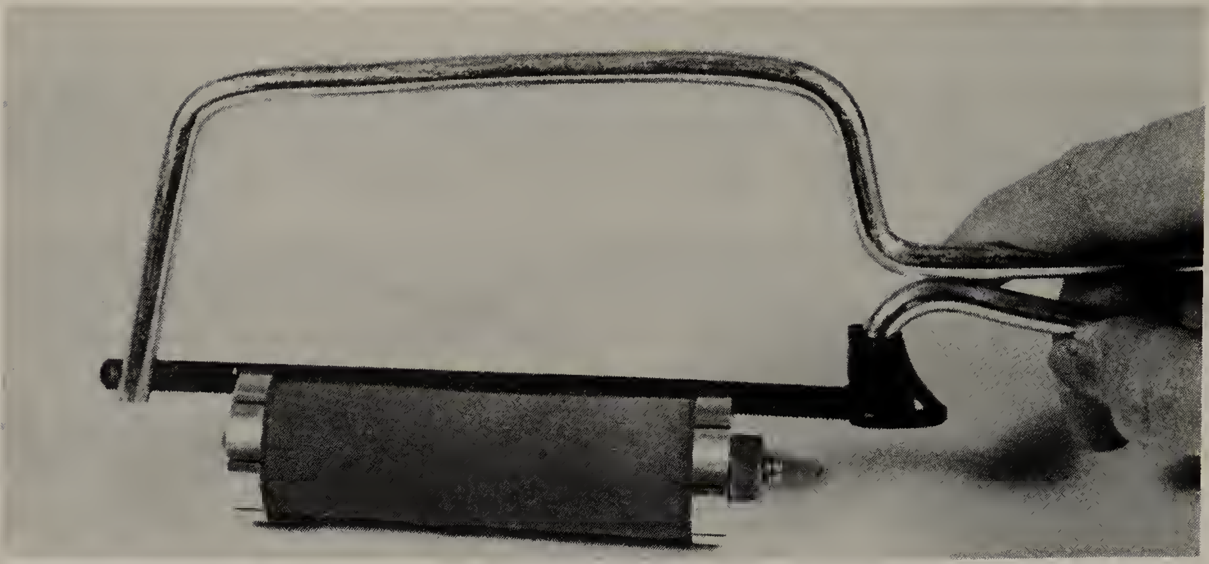
The first tool was initially designed by RodCrafters Jerry and Joyce Benyo for making checkerboard patterns from Customgrip. Its name is simply the Inlay Jig. The first step is to turn two cylinders of grip material, one of each color to be used. The diameter of the cylinders should match and be slightly smaller than the metal discs on the tool. Each cylinder is then cut into lengths no longer than three inches.

To use the tool, one of the discs is screwed all the way onto the threaded bolt until it stops against the bolt's head. A cylinder of grip material is then slipped over the bolt followed by the other metal disc and the lock nut. The disc is drawn up tight against the edge of the grip and held there by the nut. The nut should be tight but not so tight that the grip material bulges or twists.

There are eight slots in each metal disc. One of the discs must be turned so that the slots in both discs are aligned. A thin-bladed fine-tooth saw is inserted in a pair of opposing slots and the grip material cut to the bottom of the slots. This is repeated in each of the eight slots. When the grip material is removed it can be separated into eight long, pie-shaped wedges. The procedure is repeated with the second cylinder (the other color).

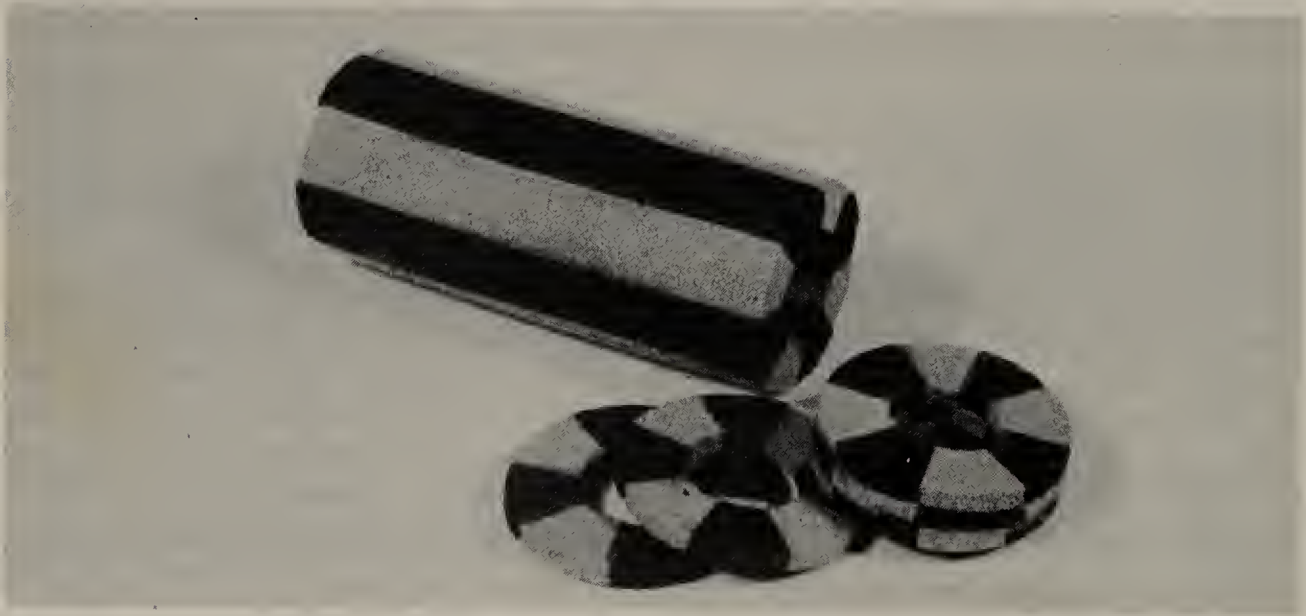
The next step is to glue alternately colored wedges together to make a striped cylinder. Thinned contact cement is used with the gluing technique explained earlier. When the eighth and last wedge is to be brought into contact, spread the cylinder apart so that the first edge is brought in contact, then the last edge. Another striped cylinder is made from the other eight wedges.

Slip one of the cylinders on a mandrel and chuck it in your lathe. You now can cut rings (or slices) from the striped cylinder. It is important that the rings all be exactly the same thickness. These rings are your building blocks for gluing together the checkerboard



Mini-saw is placed in aligned slots on the Inlay Jig to cut a cylinder of grip material.

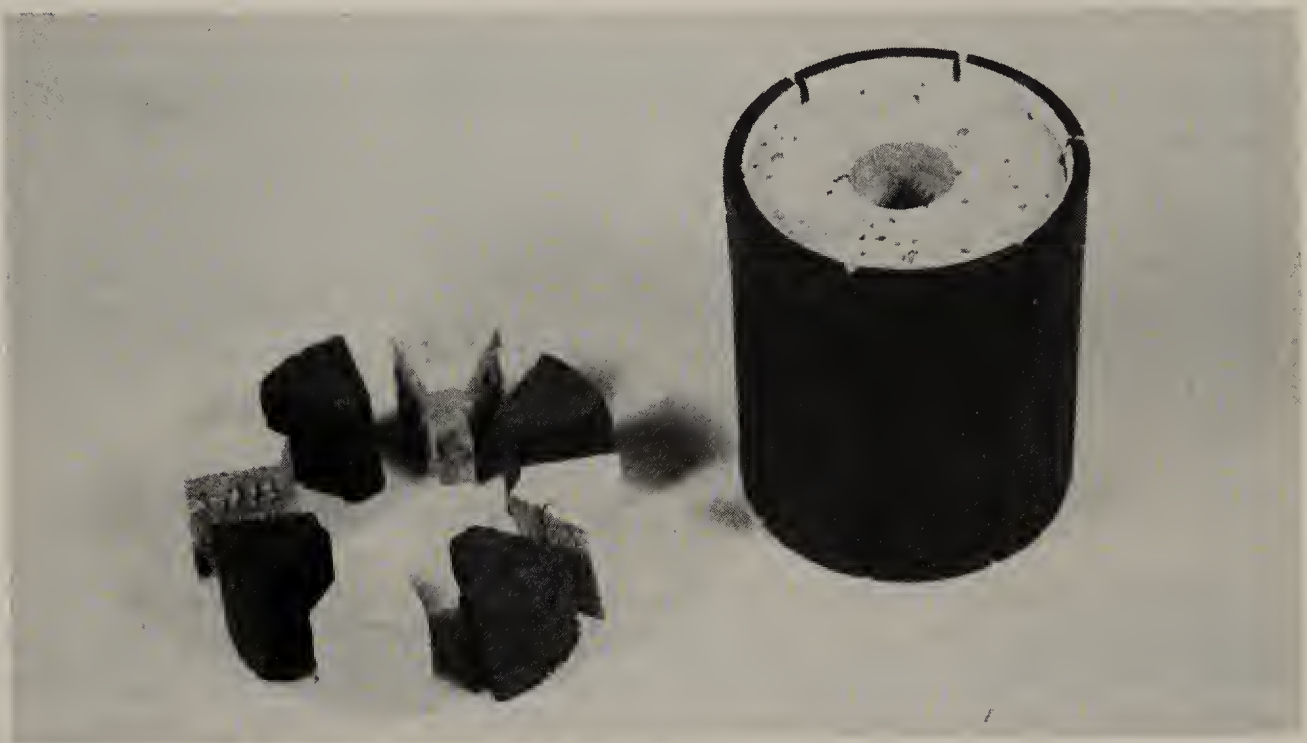
Three-inch-long pie-shaped wedges cut on an Inlay Jig.



Alternately colored wedges are glued into a cylinder, then sliced to produce rings for checkerboard inlays.

sections that are inlaid in your grips. Using this method you can make up a sizable number of checkerboard patterns ahead of time, all ready to be cemented into future grips. Or, if you feel you may want to use thicker or thinner rings on a future rod, cut only what you need for the present project and store the striped cylinders for future use.

The second tool, J.J.'s Jig, was developed by RodCrafter Jack Justis for making checkerboard inlays of Customgrip II, of cork (regular and burnt) or of a combination of both materials. The tool consists of a round plastic receptacle with eight slots around the edge. This will perfectly hold a cylinder of grip 1⅛ inches in diameter and up to ½ inch thick. That happens also to be the size of the most commonly used cork rings.



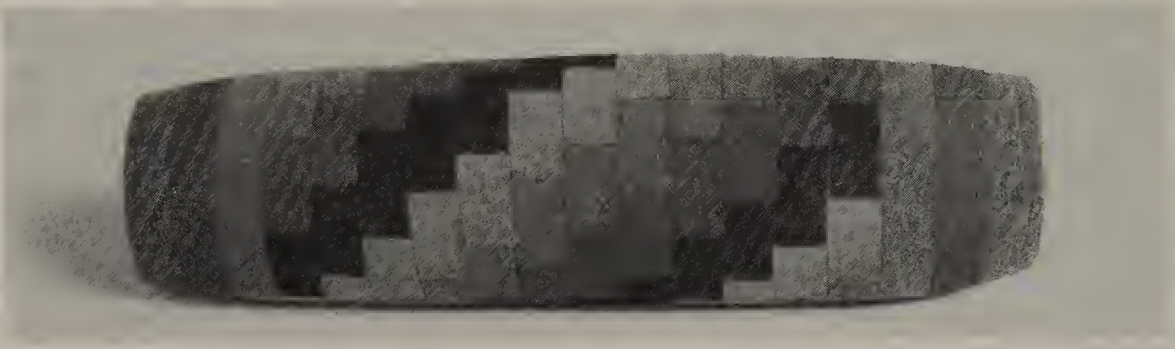
J.J.'s Jig with a cork ring in place. Pie-shaped wedges of burnt and regular cork were scored in the jig, then cut.

The rod builder first turns each of two colors of grip material to a cylinder 1⅛ inches in diameter. From each cylinder he slices off rings of the thickness he wants for each layer in the checkerboard pattern. All the slices should be the same thickness.

To make the pie-shaped wedges, one of the rings is placed in the jig. A thin-bladed, fine-tooth saw is placed through two opposing slots and the surface of the ring is scored for each of the four cuts. The ring is removed and the cuts completed, thereby producing eight wedges. The procedure is repeated with enough rings of each color to make the desired checkerboards.

Gluing is done with thinned contact cement as discussed previously. Each layer of alternately colored wedges is assembled on the adjacent surface. I find it helpful to use tweezers for this. For example, if we were inlaying a three-layer red and black checkerboard, bordered with thin black rings, in a gray grip, we might proceed as follows: On a thin black ring glue the first layer of red and black wedges. On top of this, cement the next layer of checkers, but offset. On top of this glue the final layer of wedges, again offset. Now finish it off with another thin black ring like the first. The pattern can now be inlaid where desired in the gray grip.

You can also use J.J.'s Jig to make striped cylinders of alternately colored wedges ½



"Indian Blanket" pattern on a grip made of black, gray, bright blue, and red pie-shaped wedges with two of each color to form a slice. When glued, each slice is offset slightly so the pattern rotates around the grip.

inch long. These can be slipped onto a mandrel and sliced into thin rings just as with the first tool, the Inlay Jig.

If you are making your checkerboard pattern of regular cork and burnt cork, cut the cork to the thickness desired for each layer of the checkerboard. From there proceed in the same fashion as described for the resilient grip. For the gluing you have two options. You can use contact cement or you can use epoxy glue. If you choose the latter, the tool comes with a two-piece cylindrical clamp that will just fit around the checkerboard. Spray it with Pam or wipe it with Vaseline for a release agent.

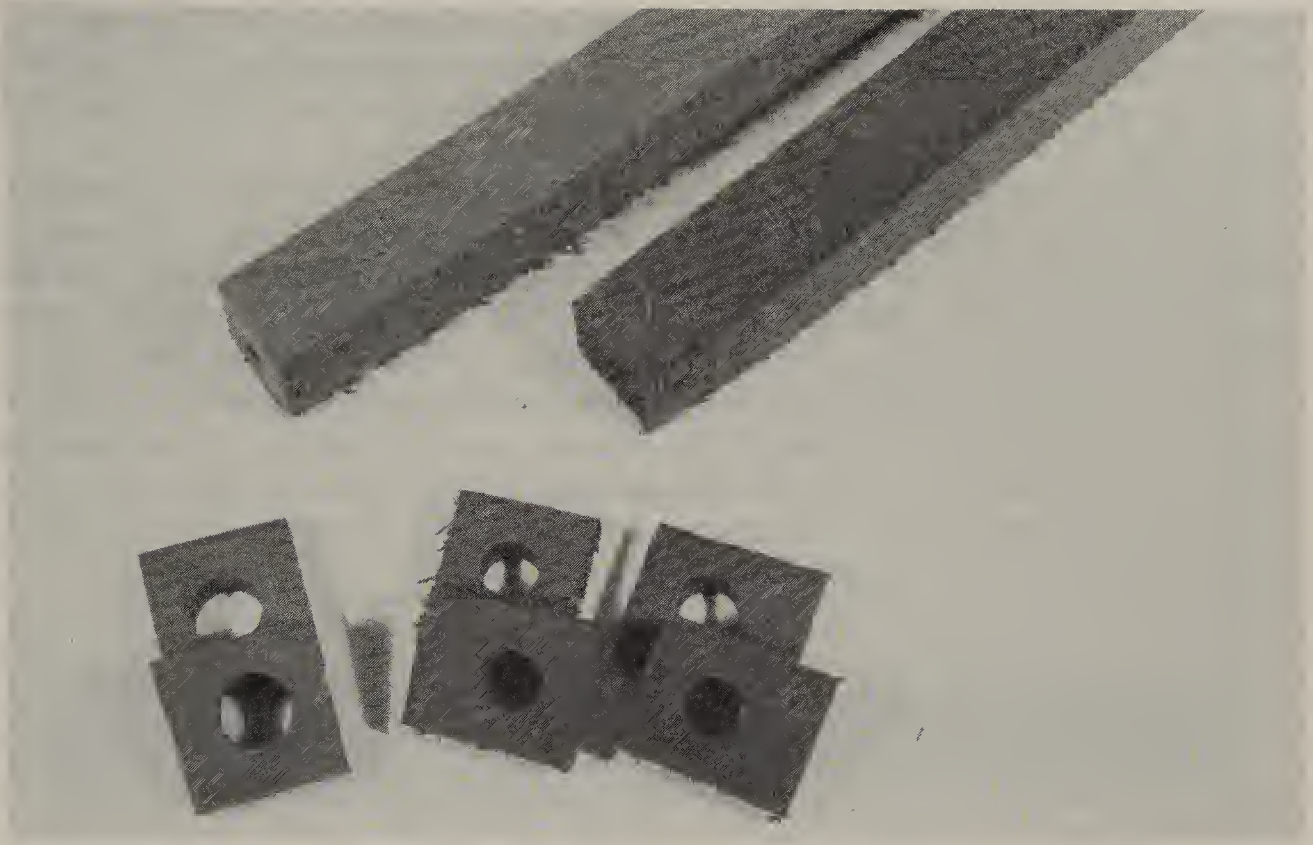
LAMINATING RESILIENT GRIPS

Turning cylinders of resilient grip material and slicing rings is not the only way to inlay resilient grips. Unshaped Customgrip II comes in turning squares with the hole already bored through the center. RodCrafter Glen Haynes makes some unique inlays working directly with the square stock. As he points out, all woodworking techniques for laminated turnings start with strips and slabs of "square" stock. They are glued together before the wood is turned round. Customgrip II can be cut to accurate proportions with a table saw, radial arm saw, band saw—any power or hand saw. It is much easier to work with than wood, yet all woodworking methods are applicable.

Using only a fine-tooth saw blade and some imagination, we can fabricate square laminations that can be turned into striking resilient grips. These are designs that would be extremely difficult to make from round stock. We'll just touch on some ideas that may get you headed in the right direction.

Although we have referred to the unshaped grip material as "square," it really is not perfectly square with the hole in the exact center. The material is cured in flat slabs which are then rough-cut into strips. The two cured surfaces will be pebbly smooth and easily discernible from the rougher sawn sides. If for any reason you want to true a piece of grip material into an exact square, use one of the parallel, cured sides as your reference.

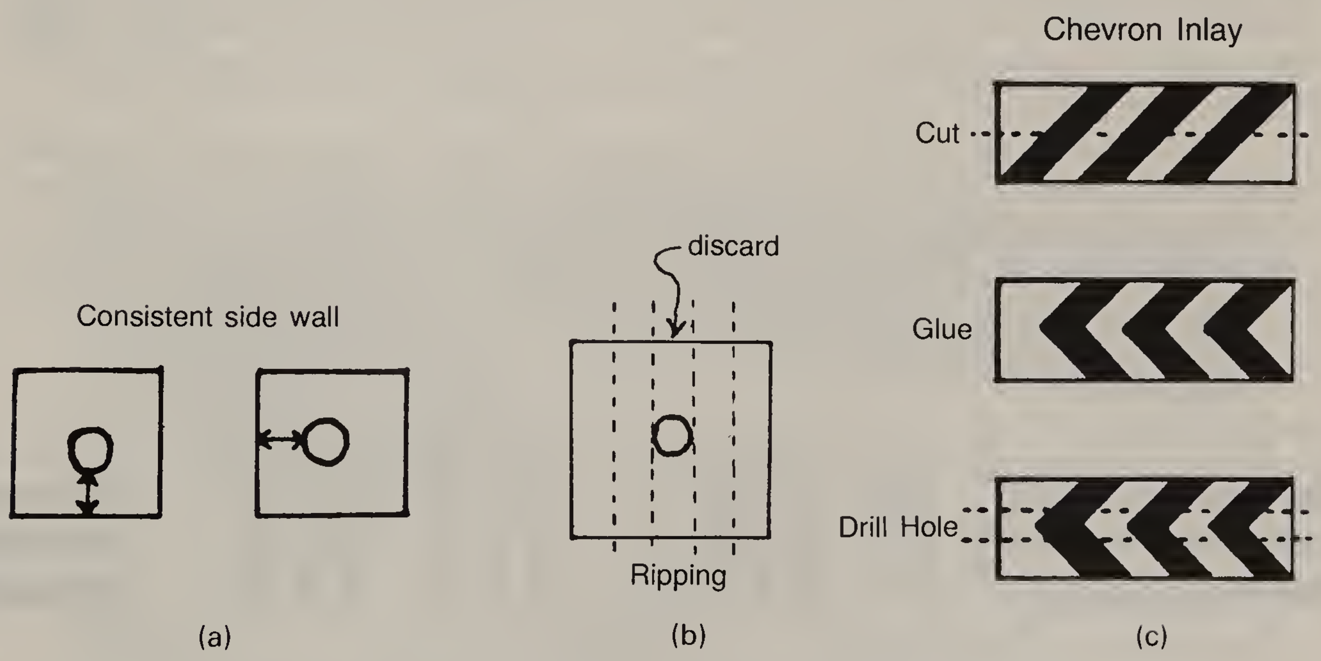
Since the location of the hole does vary among pieces, we have to be careful when working with different colors that we want to inlay. I first check for a consistent side-wall dimension and mark that side on each piece. Usually this is the smallest dimension from the hole to the outside wall. Thereafter, when making saw cuts I place each piece of grip on the saw table so the marked side is in the same position. This might be either against the table or the fence, as long as it is consistent from piece to piece. Alignment of the hole is thereby made much easier when marrying and gluing pieces of grip together. Another



Unshaped turning squares of Customgrip II and crosscut slices.

technique for aligning the hole on two pieces is to slip them over a dowel rod or mandrel (the same size as the hole) when joining them.

One way to work with the material is to cut slabs of it from each side of the hole. You are then working with solid pieces of grip from which to laminate your own turning squares. This means you will have to drill or cut your own hole. If the length of the solid section is relatively short, two to three inches, you should have no problem. Many of the laminated designs are short pieces that are glued between pieces of regular grip material in



Working with an unshaped turning square. (A.) Determine a consistent sidewall for aligning cuts. (B.) Rip long slabs. (C.) Steps in making a chevron inlay.

the same way the checkerboards are inlaid. The chevron-pattern grip is made this way. You can make a hole cutter from seamless brass tubing of the desired size. As explained under *Round inlays*, sharpen the leading edge slightly and chuck the piece of tubing in a lathe or drill.

To fashion a chevron pattern, first make 45° crosscuts to produce the stripes that will form the chevron. Cement these slices together. Next, using your thinnest saw blade, rip cut exactly down the center along the axis. Flip one of the two halves end for end and cement the two halves together so that the points of the chevron line up precisely. Square off each end with a 90° crosscut. Use a tubing cutter to drill a hole down the center.

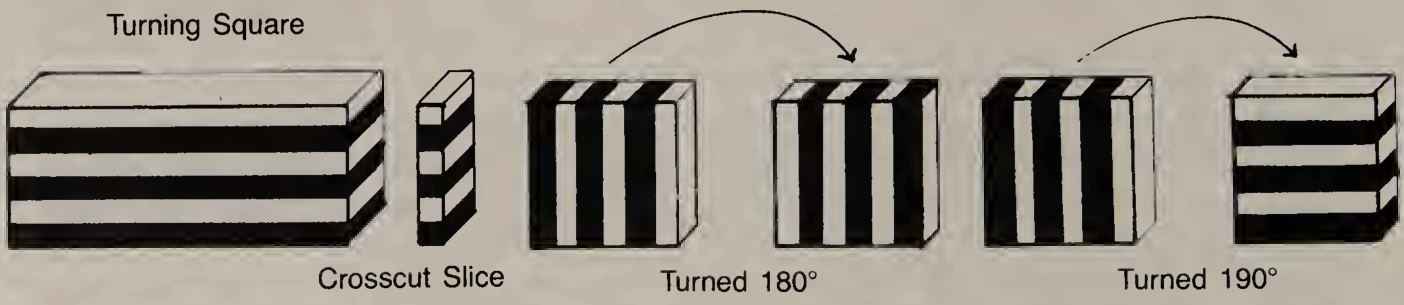
You now have a chevron section that can be inlaid wherever desired in a grip. Its length is up to you, as is the width of the different stripes. I built an all-black spinning handle assembly (black grip, reel seat, and butt cap) on a black graphite blank. There was a red, gray, and black chevron inlaid on the butt grip and the fore grip. This pattern was repeated in a chevron wrap, with black base wraps. It really looked terrific.

Two chevron patterns inlaid in the grips of a spinning rod.

Another lamination, which can be the basis for a variety of patterns, starts as stripes. We begin by ripping slabs of material from the length of the unshaped grip. These are then ripped along their length to produce pieces of equal thickness. These, in turn, are glued together in layers of alternating color to form a turning square. An even number of layers gives the best results, and for usual grip diameters six layers works quite well. Therefore, I measure the narrowest part of the grip and divide by six to determine the thickness of each piece (layer) to be ripped.

When glued together, we have stripes—a very simple but effective pattern, ready for turning. *Variations*? Increase the number of layers and make those near the center thicker and those near the edge thinner. Or take the basic six-stripe piece and crosscut it into fairly thin slices. As these are glued back together, offset each piece by a few degrees so that the stripes swirl around the grip. I'm sure you can create more.

Here's how to use your six-stripe lamination to make a different type of checkered (not checkerboard) pattern. Make 90° crosscut slices, each the same thickness as the thickness of each layered stripe. Turn every other slice 180° and cement them together for the desired length of the checkered pattern. Drill your center hole with the tubing cutter



(A.) Slabs of grip material laminated into a striped turning square from which slices can be crosscut. (B.) Turning the crosscut square 180° before regluing. (C.) Turning the slice 90°.

and inlay with sections of regular grip. Glen Haynes likes to use one color of grip at one end, the other color at the opposite end. The checkered inlay then becomes a color transition section in the finished grip.

Variations? Turn the crosscut slices only 90° instead of 180° for an assortment of different-size checkers and short stripes, depending on how you taper the grip when you shape it. Or if you want short stripes on each end of your 45° checks, cut two blocks of the basic six-layered turning stock so that one end is at 45° and the other at 90°. One of these blocks is glued on each end of the 45° checkers, restoring your ends to 90°.

By now, I hope I've given you some idea of the huge number of possible laminations for inlaid grips. All it takes is an adventurous spirit and an eye for appealing design.

Round inlays

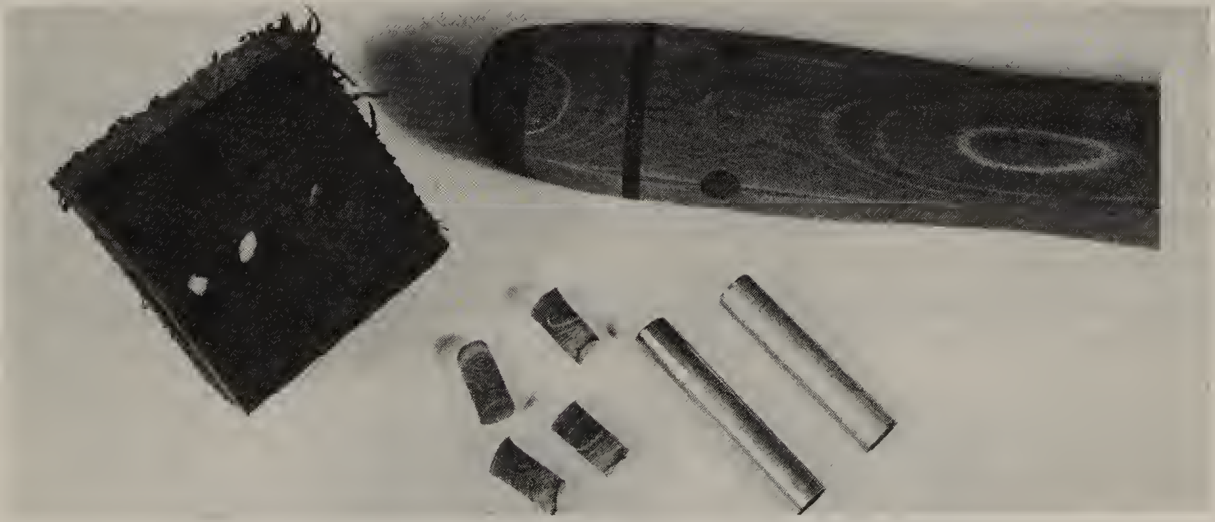
Small, perfectly circular inlays have the appearance of dowels and are reminiscent of the plugs once used in wood joinery. When four such contrasting plugs are inlaid equidistant around the grip, there is a strong feeling of symmetry in the design. All you need to make these inlays are some easily fabricated plug cutters along the lines of those made by RodCrafter Ed Roberts.

Start with an assortment of seamless brass tubing of the type that nests; each size fits perfectly inside the next larger size. Most good hobby shops will have this in sizes ranging from 1/8 inch O.D. to one inch O.D., usually in 1/32-inch increments. You want a nesting assortment that will cover the largest and smallest plug you expect to make.

Cut a piece from each tube to a convenient working length, 1 1/2 to three inches. The tubing can best be cut with a jeweler's saw using a 4/0 blade, 80 teeth to the inch (a blade with less teeth per inch tends to catch on the tube wall). The tubing should be cut square; if the ends are not square they should be dressed with a file.

The cutter is sharpened by inserting it in a lathe, drill press, or drill. A bevel is cut with a fine file while the brass cutter is revolved at high speed. Try for an angle of about 30°. This will produce a sharp enough edge without thinning the tubing wall excessively. To use a cutter, chuck it carefully into an electric drill, drill press, or even a rod-building lathe. Tighten the chuck just enough to hold the cutter. Too much pressure can crush the cutter's walls.

When making a round inlay you will always use a pair of nesting tubing cutters. The



Round or plug inlays. The smaller cutter was used to make the holes in the grip, and the large cutter made the black plugs.

smaller will be used to cut the hole in the grip and the *larger* will be used to cut the contrasting plug. In this way you are assured of a tight fit. For example, to inlay a black plug in a gray grip you would cut the hole in the gray grip with the smaller cutter. The next-size larger cutter would be used to cut a black plug from a waste piece of material. A pair of tweezers or a needle may be needed to withdraw the plug from the cutter.

The plug is glued into the grip after the grip has been rough-shaped. Check the grip's wall thickness at the inlay hole and cut the plug about 1/16 inch longer. Give both the hole and the plug a light coat of thinned contact cement and allow to dry for 15 to 30 minutes.

When you are ready to insert the plug, give it a coat of thinned contact cement and immediately push it into the hole. The plug should project out of the top of the hole by at least 1/16 inch. This assures you that the plug is not projecting into the center hole running the length of the grip. Allow the glue to dry at least overnight. Use a sharp blade to trim off the top of the plug. You can now complete the shaping of the grip, sanding the plug flush with the grip's surface.

CORK AND RESILIENT COMBINATIONS

Cork is shaped by sanding and rarely cut with a blade. If you inlay a cork grip with another material, then sand the grip to shape and finish it, you will probably experience a great deal of difficulty. Hard materials such as wood and plexiglass will be less abraded by the sandpaper; the cork around the hard material will be sanded to a smaller diameter and the hard material will project from the surface of the grip. This is why wood and plexiglass trim is turned to the finished diameter before it is glued with cork rings. The cork is then carefully sanded down to the size of the hard trim.

If you were to inlay a soft, spongy material in a cork grip you would also have trouble. Here, the spongy material would compress under the sandpaper and not be abraded. The cork would again be of a smaller diameter than the inlaid trim.

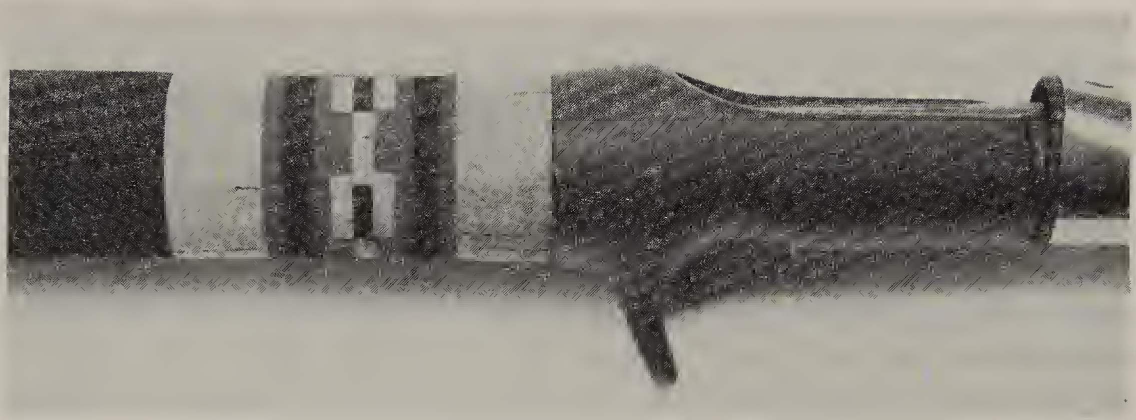
Resilient grip materials generally fall into these same two categories. Hypalon, while not hard like wood, is very tough. It and other grip material similar to it will be much less abraded by sanding than the adjacent cork. On the other hand, soft and mushy grip material will compress beneath the sandpaper, causing it to be reduced more slowly than the cork portion of the grip. In either case it will be extremely difficult to get a smooth, even surface.

Only materials that abrade from sandpaper at the same or very nearly the same rate as cork can be glued with it, then the whole grip turned to shape. Customgrip II is the only such material I know of at the present.

This means cork grips can be inlaid with various colors that will complement the color scheme of the rod. Of great importance, the inlaid designs or trim rings can be placed wherever they look best on the grip, even directly beneath the hand. The non-slip texture of both materials is quite similar—not, for example, like hard plexiglass or wood.

The technique for inlaying combinations of cork and resilient material is almost exactly the same as if the grip were entirely of resilient material. For example, the same

Grip made of cork with black and gray inlaid Customgrip II.



Combination grip made by Jack Justis using cork and Customgrip II in black and red.

tools can be used to fabricate a checkerboard pattern; the cut pieces of cork and resilient material are joined using contact cement; and the grip is turned and shaped with sandpaper. Any difference in abrasion rates seems to even out when you progress to using very fine (250 to 300 grit) sandpaper. At that point, turn the grip at high speed and hold the very fine sandpaper *very lightly* against the grip. Use very little pressure. This will remove the slightest bit of resilient material without abrading as much cork, and the grip's surface will be smooth and level.

At the beginning of this section it was stated that cork is rarely cut with a blade. This is because cork tends to split and crumble when a knife is pushed into it. Therefore, whenever you want to cut cork in order to inlay it, use a fine-tooth saw. X-Acto makes some thin miter saws that are excellent, as are some mini hack saws.

Many times you will want cork rings that are smaller than the standard ½-inch length (thickness). For example, three narrow trim rings inlaid in most cork grips will look best if the trim rings are closer together than ½ inch. Two rings of ¼ inch may look best as spacers. Another example would be the thickness of cork rings in a checkerboard pattern. These designs usually look better when the layers are relatively thin. If you have a power saw and fine-tooth blade, you can cut the cork rings to the desired thickness—*but use a push stick to keep your fingers away from the blade.* I frequently will use a preglued cork stick just because it is safer and easier to work with. Admittedly, the quality of cork used in sticks is not quite as good as in rings. However, it shows less in thin inlays.

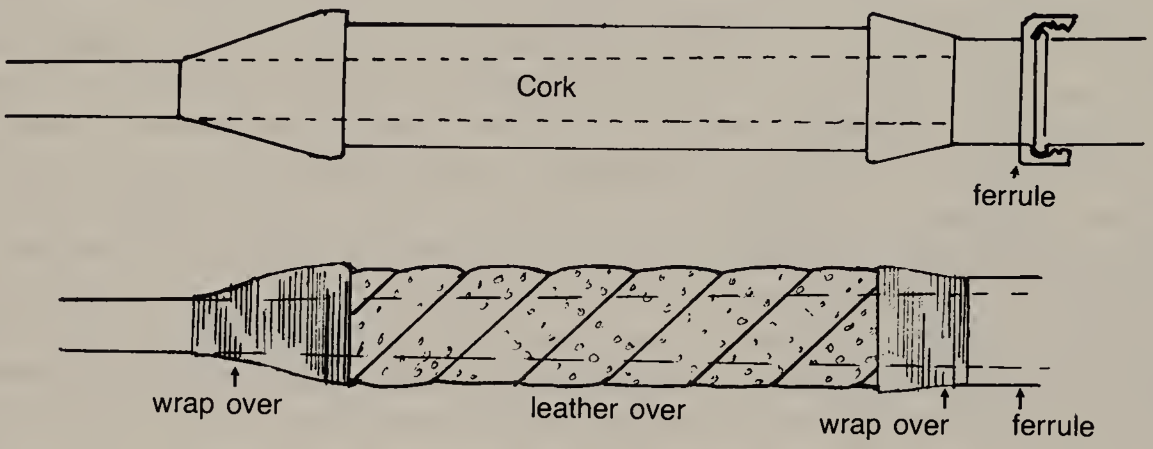
Whether you prefer cork or resilient grips, you can enhace their appearance with inlays. There was a time when burnt cork was the only material that could be glued and shaped with cork and had the same texture in the hand. The only problem was that it existed in just one color, brown. That harmonized beautifully with brown blanks. On blanks of any other color, you pretty much needed to use browns and other warm, earth colors in the wraps to tie everything together. No longer! Natural dark gray graphite blanks look super with cork grips inlaid with black. Or try a small inlay pattern of black and red against the cork, then pick up the red in the wraps. The same can be done with bright blue instead of red.

The custom rod builder who enjoys injecting his creative design into his grips never had it so good. Cork, burnt cork, and the many colors of resilient material can all be combined on his palette.

LEATHER GRIPS

One of the best and finest-looking foregrips on the heavier classes of offshore big-game rods is a leather grip. Whether real leather or vinyl, these grips are most always built over a cork form and have many functional advantages for the 80-pound, 130-pound, and unlimited classes. These rods are fished from fighting chairs, usually equipped with a harness, for big, powerful fish. In this type of fishing a great deal of physical pumping of the rod is done. The hand, or more likely both hands, will cradle the grip and lift the rod through an arc. Since the weight and resistance from the fish is substantial, the hands are less likely to tire if they do not sink into the grip.

Leather (and with that term we include man-made imitations) has a very good non-slip texture. The grips can easily be made in the large diameters and long lengths frequently desired for these powerful rods. The construction method also lends itself to the preferred shape, which swells gently in the mid-section and tapers gracefully into the blank at the front.



Leather foregrip. On top is the form made of cork rings, to which the leather is glued. The ends are wrapped over with thread.

RodCrafter Joy Dunlap has been making these grips for many years. He occasionally uses real leather but most often wraps the grips in vinyl automobile steering-wheel cover material. This is readily available at auto-supply stores in a variety of colors. Another source of material for this type of grip is leather man-made synthetics sold for wrapping handles of tennis racquets and golf clubs.

A finished leather foregrip made by Joy Dunlap.

Construction starts with the cork form, made of large cork rings epoxied directly to the blank. After the glue cures, the cork form is shaped into a basic cylinder with tapers at each end. These tapers will be wrapped over with thread later, so do not make them too steep. The foreward end of the grip, where the blank emerges, will require the most care. The object is to feather the leading edge of the cork into the blank so the thread can be wrapped from the blank up over the cork. When sanding the cork this thinly, tiny pieces will sometimes crumble and break away. Don't despair. The feathered edge can be restored with PC-7, Plastic Wood, or a non-flowing epoxy. PC-7 works especially well since you can dip a finger in alcohol and feather the edge beautifully. Allow it to cure completely.

The next step is to complete the shaping of the cork form. It is undercut over the entire length of the grip except for each end, where there is a slight shoulder. The depth of the cut should be approximately equal to the thickness of the grip material to be wrapped on, and the shoulder should be square. If in doubt, make the cut on the shallow side. A test wrap of the leather will reveal if it has to be made deeper.

Your grip material should be about 1⅛ inch wide and about four feet long. Test wrap it, without glue, over the cork to see if it's long enough. If not, you will need to use two pieces and wrap them side by side.

When everything tests properly, paint the cork the same color as your grip material and allow the paint to dry completely. This is important or the bare cork may show through between the winds of leather.

The grip material is mounted with contact cement. Apply a coat to the cork and to the back side of the material. After allowing the cement to dry for about 15 or 20 minutes, the surfaces will adhere on contact and be impossible to move or reposition. Be careful to align the leather properly at the start and as you wrap it.

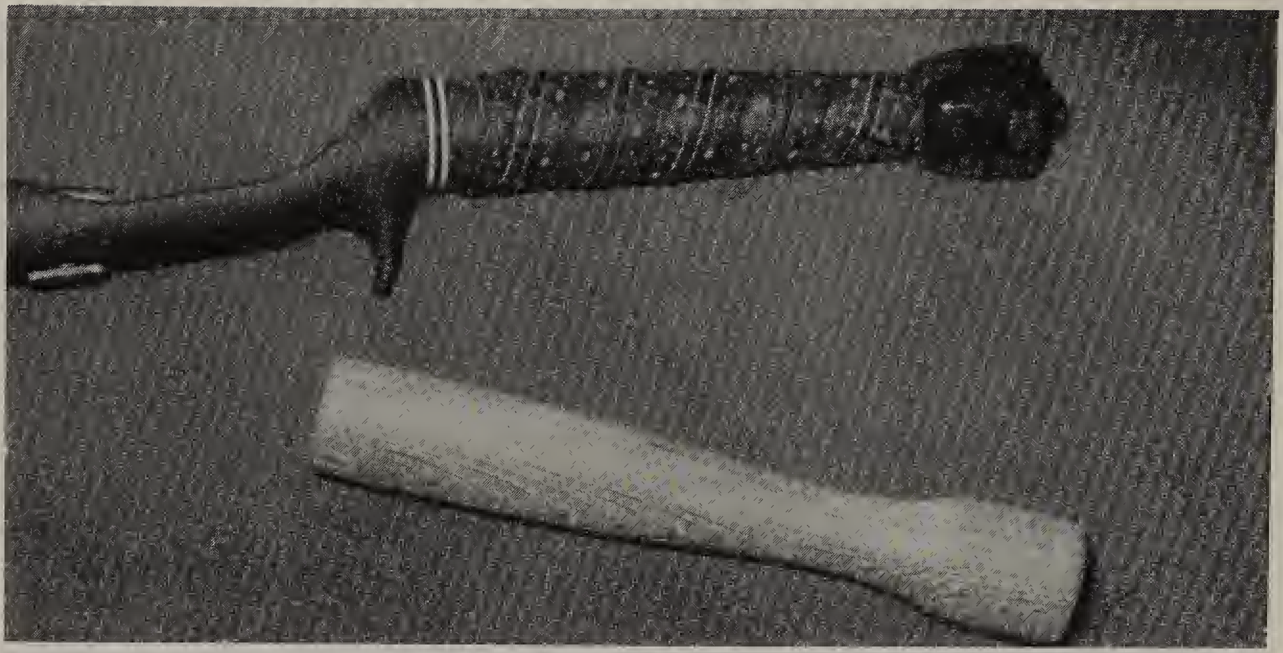
Start the material at the butt end of the undercut section of cork. Lay it at a 45° angle, then trim it with an X-Acto knife so that the leather is flush with the cork shoulder. To help hold the material in position while wrapping, pins can be pushed through the very end of the leather into the cork. Bulletin-board push pins with plastic heads work well for this.

Spiral the material carefully over the cork, making sure that each turn lies against the previous turn, thereby eliminating any gaps. Press the leather onto the cork a few inches at a time. If you are winding two strips at once, wrap a few inches of the strip closest to the butt end first, then wrap the next strip, making sure you get good, tight seams as you go along.

When you reach the end of the grip, carefully cut the leather so it will fit flush with the shoulder of the undercut. Now go over the entire grip, pressing the leather as firmly as possible against the cork. If you have a rubber or wood mallet it will help strengthen the bond if you tap the leather. Cover each end of the grip material at the point where it meets the shoulder with ¼-inch plastic tape of the same color as the material. This hides the seams, reinforces the ends, and provides a base for wrapping with thread. To prepare the tapered cork ends for wrapping, apply one or two coats of your favorite wrapping finish to the cork and to the ¼-inch plastic tape. Attempting to wrap thread over bare cork is frustrating since the thread will not slide as it does on a blank. The cured finish provides a slick surface on which thread is easily wrapped and burnished.

Thread is wrapped over both tapered ends of cork and over the ¼-inch plastic tape. At the tip end, this wrap is usually a continuation of the base wrap on the decorative butt wrap. These wraps are color-sealed and finished the same as the other wraps on the rod.

RodCrafter Jack Justis uses a similar technique to make leather grips on casting-rod handles. He finds that many bass fishermen are more comfortable fishing a straight-grip



Fuji handle, customized with a leather grip by Jack Justis.

handle than the more popular pistol grip. He can also build the handle to the customer's preferred length.

To make the handle, start with a Fuji casting handle and slice the pistol-grip material so that it can be removed. The shaft inside most models is not round, but has three flukes or ridges. Grind or saw these off so that you have a single shaft. See *Customizing a casting handle* in the next chapter.

You next need to make a form to extend the handle-grip length as desired and over which you will wind the leather. Jack makes his of lightweight, clear white pine. He first bores a hole for the handle shaft, then turns the form to the desired diameter. Another possible material, here, is a length of aluminum tubing with a hole to fit the handle shaft. If the outside diameter needs to be increased, this can be done with cork rings.

After the extension form is epoxied to the handle and the glue has cured, you are ready to apply the leather. Jack uses real leather, sold for covering tennis-racquet handles. This is bevel-cut on the underside and must be overlapped when it is spiral-wound. Each wind therefore anchors the previous one, but it appears as if the edges are butted against each other.

Contact cement is used and the leather is started at the end nearest the reel-seat portion of the handle. It is cut at 45° and wound over the form at that angle. At the butt end, the leather is cut off flush. A butt cap is then epoxied over the end of the form. If the cap is to fit fairly level with the diameter of the leather, the wood form will have to be undercut. The depth of the undercut would be the thickness of the leather plus the wall thickness of the butt cap. This undercut would be made when the form is shaped.

CORD

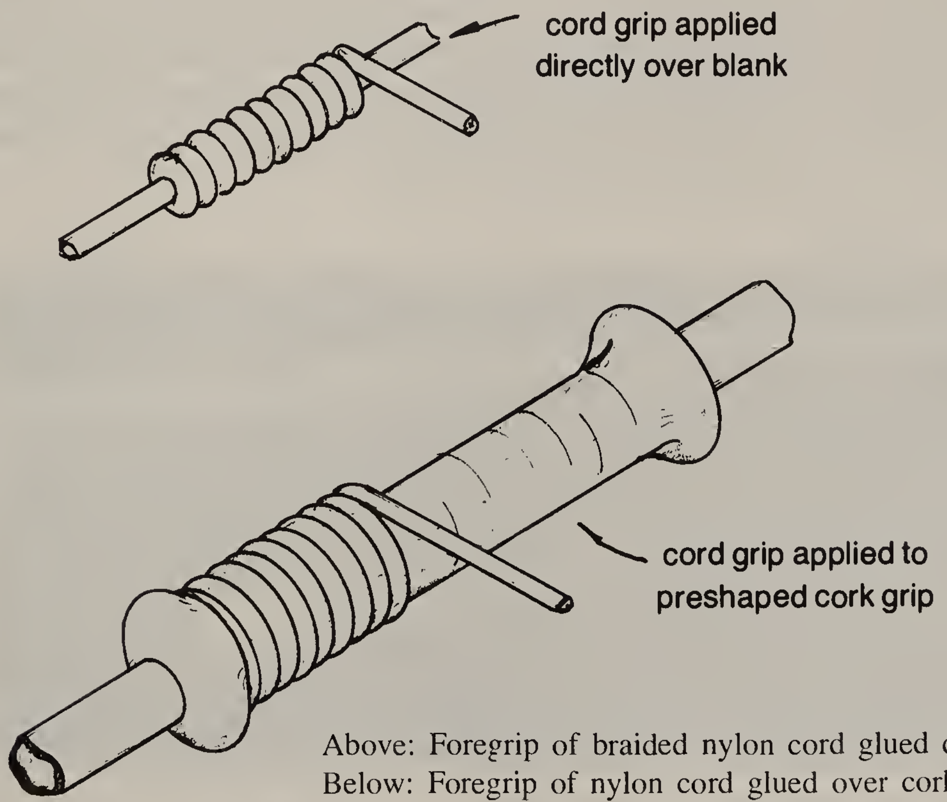
Interesting foregrips can be made of nylon cord wound on the blank. Many fishermen feel the rough texture of the cord makes an excellent gripping surface on large offshore trolling rods. RodCrafter Scooter Barefield has had excellent results using braided nylon trotline of about ⅛-inch diameter. His method of installation requires the help of an assistant.

First coat the desired section of the blank with a thick coat of slow-curing epoxy glue. The starting end of the cord is unbraided, or frayed, to reduce the bulk where it is wrapped over. The wrap is started the same as for a conventional guide wrap. The assistant turns the rod while you guide the cord onto the blank under moderate tension. Make sure the cord lies flat and untwisted. To end the wrap insert a tie-off loop of the same cord, and pull the short cut end under the wrap. As an extra bit of security to hold the end of the wrap securely, Scooter puts a coat of fast-curing epoxy over about 1/2 inch of the end.

Scooter points out that any length grip is possible, and that if the cord ever wears out it is easy to replace. The latter is important, since the guides will not have to be removed as would be the case with conventional foregrips.

An interesting variation of this technique that results in a larger-diameter foregrip preferred by some anglers is to build it on top of a preformed cork grip. While the entire cork surface could be covered from end to end, the easier method is to leave the ends of the cork exposed. First build a cork foregrip of the desired dimensions. Then evenly sand down all but about 1/2 to 3/4 inch of each end of the cork. The depth of this recess should be just slightly less than the diameter of the cord to be used. After the cork form is mounted on the rod, use Scooter's technique to wind the cord the length of the recess.

When viewed under a microscope, nylon is actually very porous. It thus accepts common dye (such as Rit) quite readily, with the results being colorfast. This provides the rod builder with another variable with which to achieve a color-coordinated, custom appearance. Dyes can even be mixed for special colors. Select a color to complement the guide wraps or another component on the rod. For example, you can match dyed nylon shock rings on some ceramic guides, as well as dyeable winding checks and dyeable plastic trim rings. Dye and completely dry the cord first, then proceed with making the wrap. If desired, the exposed ends of the cork can be painted a matching or contrasting color after filling the pits. The painted cork is protected with a few coats of epoxy wrapping finish. To ensure that the wrapping finish will not lift the paint, place a coat of Brilliance or clear white shellac over the dried paint. After it dries, apply the epoxy.



Above: Foregrip of braided nylon cord glued directly on blank.
Below: Foregrip of nylon cord glued over cork form.

We have found that cord grips are also used by some custom builders for the butt grip on surf rods and two-handed pier and jetty rods. Still other builders use the technique for fashioning both fore and butt grips on freshwater spinning rods.

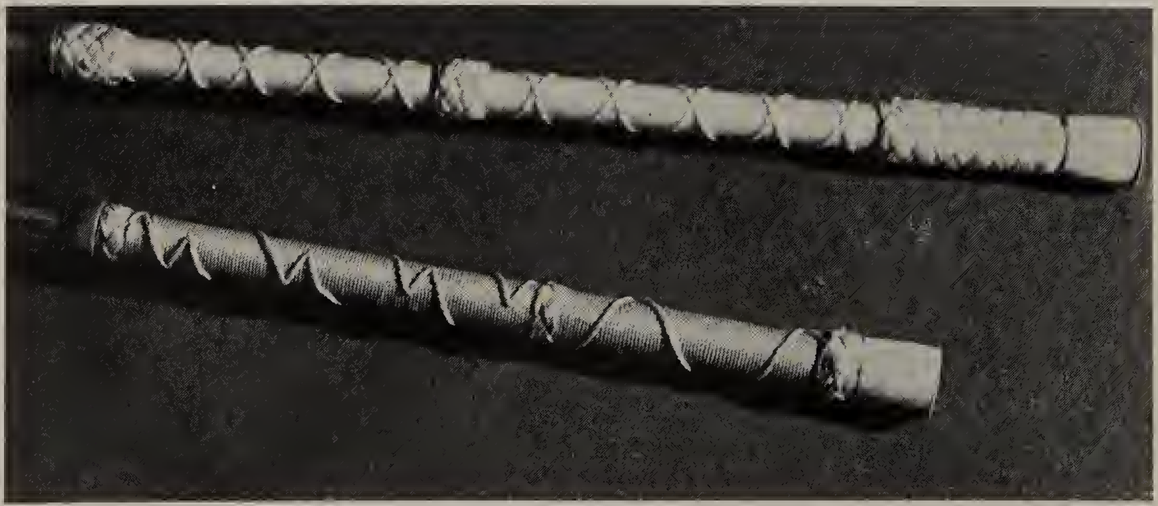
Another more intricate and very decorative method of working with nylon cord was developed by RodCrafter Norma B. Stirrup. A few years ago her son attended Farragut Academy Summer Naval Camp and was introduced to the nautical knot work used by sailors on the old sailing ships. They used rope work and knots to dress up and identify their belongings. Her son became very adept at the craft, and as Norma watched him decorate lamps and landing nets, the idea of using it on custom rods emerged.

Her first applications of the technique were on the long butt grips of surf rods. Here it provides a secure grip during the cast and protects the blank against nicks and gouges. The latter is of special consideration when fishing from rocky shorelines such as found in New England where the rod often gets tucked into crevices between casts. The cord she uses is nylon, which is available in many different sizes. Cord diameter is not critical as long as it is not too fine. It should be chosen for compatibility with rod type and size, as well as the effect desired.

Norma's nautical-style wrap is put on over the bare blank after the reel seat is installed. Since the wrap is one continuous length, it is worked directly from the spool of cord. The base is a series of simple half hitches worked from the bottom edge of the seat down toward the butt end of the blank. Nylon stretches, so care should be exercised to avoid pulling the wrap too tightly. Use only enough tension to achieve a firm wrap.

A pattern ridge is formed by the crossover of the half hitch. It is controlled by the placement and direction in which the hitch is made. It can be a continuous spiral when the half hitch is formed in the same way each time, or it can form a zigzag pattern by reversing the direction in which the half hitch is looped over the end of the blank after a number of hitches have been made in one. The zigzag can be the same size each time or varied to achieve a widening effect as the butt end is approached. The zigzag can also be placed so the ridges form a thumb/finger grip at the butt.

For still more variation, a crossover pattern can be achieved by starting at the center of a very long cord (or use two cords), and alternating half hitches on each one. By doing this, two opposite spirals meet to form an X on opposite sides of the rod with diagonals on the sides of the rod. This is similar in appearance to the familiar diamond pattern. When using two cords on crossover, the long ends extend in opposite directions—the right-hand cord extends to the right when forming a half hitch, and the left-hand cord extends to the left at the completion of each half hitch.



Cord-wrapped rear grips. Note Turk's-head knots.

Another design of the crossover could be a double zigzag by reversing the direction of the half hitches at the point where the ridges meet, or just before or just after. It can be seen that creative design comes into play. And play it is, for this rope work is fun.

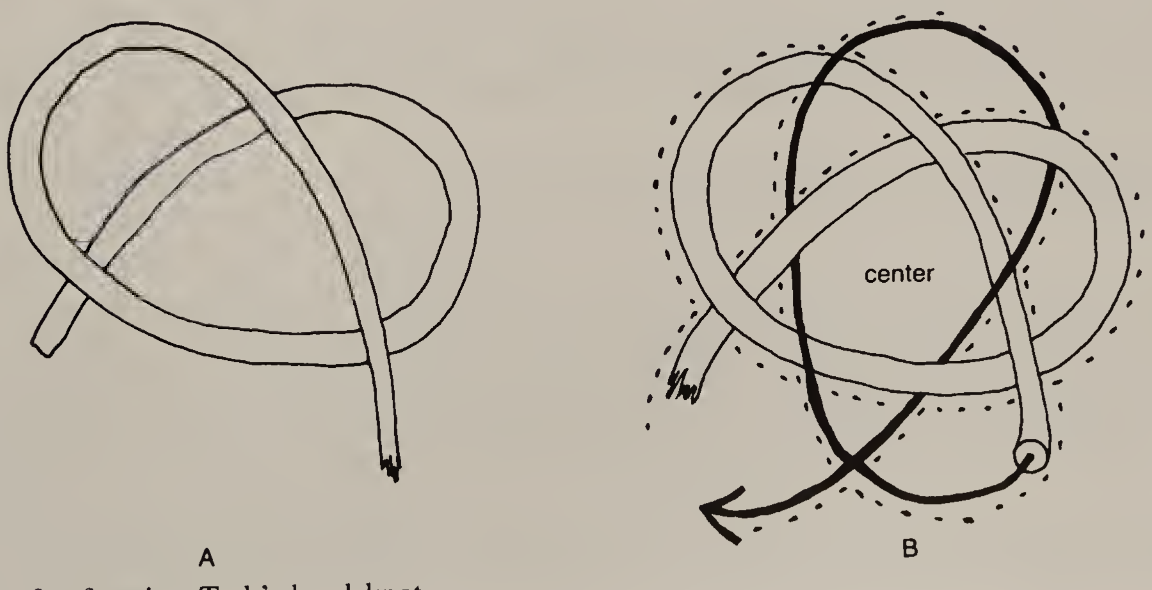
Continue along the blank with whatever pattern you have selected until the end of the butt is reached. Trim the ends longer than needed, and tape them temporarily in place. Sear the nylon ends near flame to prevent unraveling of the cord.

Turk's-heads

To cover the start and finish of the nautical wrap, call upon the sailors and use their Turk's-head knot, which was used for just this purpose. The same size cord can be used, or a heavier one selected for emphasis. A short, simple Turk's-head will do the job, but longer, more elaborate ones will be more decorative and, in many cases, provide better balance in the overall design of the rod. A long rear Turk's-head adjacent to the butt cap makes a good rear hand grip. These knots have many other rod-building applications and the technique is worth learning. This knot work can be somewhat complicated, and there is not room to explain it here. The best reference book with detailed instructions and photographs is *Art of Knotting & Splicing* by Cyrus Laurence Day, available from the U.S. Naval Institute, Annapolis, Maryland.

The Turk's-heads are initially formed on a section of dowel or broomstick with a larger diameter than the already wrapped blank. They are constructed loosely, slid into place, and then snugged up tight. Here again you are dealing with a single length of cord. A few trials will enable you to determine the length of cord needed. Naturally, it varies with the diameter of the cord and the blank. As a rough guide, you can wrap the cord loosely around the blank the number of times it will circle the blank in the finished knot and allow for a bit more length. Such estimating comes with experience, since the cord circles the blank more times than it appears to at first.

A simple Turk's-head can be formed by following the drawing. Lay the cord flat as in Diagram A. Keep the loops open and the crosses orderly. Take the long end and follow the thin line in Diagram B—over, under, over, under, over, under, and over. A large-diameter empty plastic pill container makes a good form on which to work. Leave the lid in place and use it for a handle. After laying out the basic knot, insert the pill container into the center. Follow the first "lead" around again in the under, over pattern, laying the



Pattern for forming Turk's-head knot.

cord alongside the first round as indicated by the dotted line in the drawing. To complete the simple Turk's-head, follow the lead around a third time. If a longer knot is desired, you just continue the procedure.

Snugging up is done by gradually taking up the slack from the beginning point of the knot. Work round and round, pulling on the cord until the Turk's-head is snug and even. Like any knot work, it is easier to learn by using a large-diameter cord when practicing.

When the knot is in place on the rod, the ends of the cord are tucked under the Turk's-head after first being trimmed and seared. At the butt end, the cord ends can be tucked into the open end of the blank and held there by the butt cap and the epoxy glue used to mount it. Make sure you allow adequate space for the butt cap when positioning the Turk's-head.

To finish and protect the cord, Norma applies many generous coats of thin clear lacquer. Her experience has been that the necessary thick buildup of rod varnish and most wrapping finishes will give the white nylon an amber cast. While this might blend well with the color scheme on a gold blank, she generally prefers the nylon to remain white. To build up more protection, multiple coats of a heavier clear lacquer can be applied.

I have attempted to present here merely the essence of the fascinating nautical style of custom cord work developed by Mrs. Stirrup. For the creative craftsman it presents many opportunities for further experimentation and self-expression in building custom rods. The possibilities for variations appear practically endless.

For example, as mentioned earlier about nylon cord, it can easily be dyed any color. For Turk's-heads you might want to consider a heavier flat braided nylon sold under the name Dimensional Macrame Cord, available in various colors from American Handicrafts. You can find an assortment of different cords and applicable instructional material at local handcraft shops that carry materials for macrame work. The only caution when making Turk's-heads of any flat braid is to keep it flat and untwisted while making the knot.

The use of these knots is not limited to surf rods. They can be used to cap a cord foregrip on a trolling rod or add a custom touch ahead of any foregrip on a freshwater rod. Considering all aspects, it is a fascinating technique for developing truly custom rods.

FIVE

Handle Assemblies

The custom rod builder and the designer for a rod-manufacturing company approach the planning of a given rod quite differently. The factory man must try to make a rod that fits everyone for a more or less generalized type of fishing and one that is cosmetically appealing to everybody. Although he knows this is impossible, it is what he must strive for. In contrast, the custom rod builder sets out to make a *specific* rod to be fished by a *specific* person for a *specific* fishing need. This is a very realistic goal and one that is definitely attainable.

The custom rod builder must have a working knowledge of construction techniques and materials. On the other hand, the person who will fish the rod has the knowledge of what he wants it to do, specifically. It falls to the custom builder to be the catalyst between these two different storehouses of information. His job is to perfectly fit a rod to an individual and in so doing provide him with a better fishing instrument.

A rod is fitted to an individual in various aspects, but the handle assembly is certainly one of the most important. The grip and entire handle must fit the angler's hand, his physical build, and his casting or fishing style. He wouldn't think of wearing the wrong size shoes on a hike, and in like fashion he shouldn't spend a day fishing with the wrong size handle.

As mentioned earlier, we also want our rods to look better, and the handle assembly is no exception. In fact, it can be, and often is, the focal point of the custom rod. It is ideally suited to creative craftsmanship.

To put this chapter into perspective, it should be mentioned that the basic assembly steps in building all types of rod handles are covered in my book *Fiberglass Rod Making*. That book also covers various designs and construction techniques for making and using skeleton reel seats, as well as trim rings of wood, plastic, and burnt cork inlaid into handles. Some additional techniques on the subject are also covered in this book in the chapters on reel seats and grips.

The principal classic shapes of fly-rod grips were depicted in *Fiberglass Rod Making*, along with some methods and ideas for custom-designed fly-rod handles utilizing inlays of various materials. In the chapter on reel seats in this book will be found additional designs for fly rods, including extension butts, both fixed and detachable.

This chapter, then, is devoted to more advanced methods of making custom handles, many of which are applicable to specific rods, but can be adapted on an individual basis by the creative rod designer. There are also presented additional basics, as well as advanced information on various saltwater handle assemblies not covered in *Fiberglass Rod Making*. I repeat that none of the material discussed in this chapter, or in this book, is in any way meant to be the last word on the subject. Far from it! Custom rod building by its very nature will continue to evolve, and custom rod builders will continue to create new ideas and methods. I hope some of the material presented here will help spark and accelerate that creativity and hasten future development.

FLY-ROD HANDLES

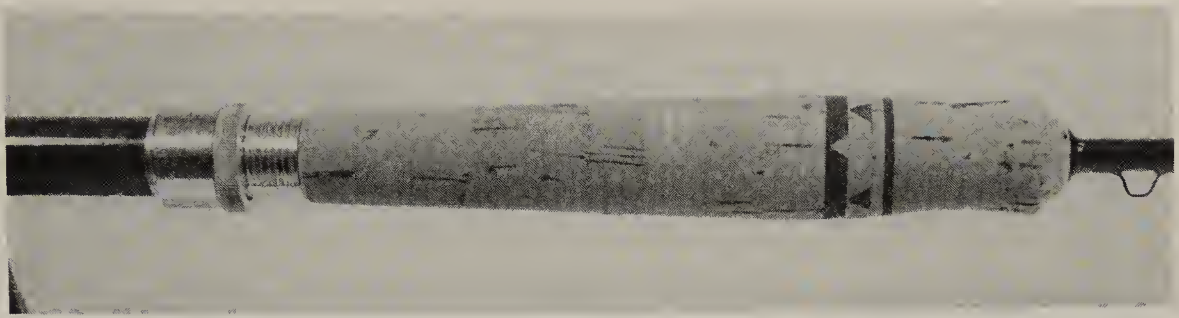
We have already examined most of the fly-rod handle assembly in earlier chapters on reel seats and grips. What I would like to emphasize here is the size and shape of the grip itself. Perhaps on no other type of rod is the grip so functionally important. The fly fisherman literally holds it in his hand the entire time he is fishing.

People come in all different sizes and shapes and so do their hands. The tennis industry recognizes this by sizing the handle grips on racquets. In fly fishing the only way to be assured of the proper grip size is to make or modify the rod yourself or have a custom rod builder do it for you. Obviously I'm not pointing out a catastrophic fault of the tackle industry, but I can't help wonder how much better at least some fishermen would cast if their rod grips really fit their hands. They would also be a lot more comfortable, would tire less quickly, and would be more attentive to their fishing.

I have a very small hand with quite short fingers. The latter is recognized, incidentally, by the clothing industry as a "cadet" size glove. On a number of occasions I've been caught in situations where I had to use someone else's fly rod for the day. If we are fishing small, light rods for #3 and #4 lines I'm usually all right, if I borrow someone's factory rod. If we are fishing saltwater with #11 and #12 lines, I'm in real trouble. Why? A long time ago, rod companies decided the best "store appeal" for a light fly rod was a slim, short grip. When the prospective customer picked it up, the almost dainty feel helped sell the rod by emphasizing its delicate aspects. In like manner, the best "store appeal" to convey the brute power of a tarpon rod was to increase both the diameter and length of the grip—give it the heft and feel of a real fighting stick. This may help sell rods, but if you think about it from the fly fisherman's standpoint it's rather ridiculous.

The diameter of the grip should fit the angler's hand. You might start by closely matching the grip on his favorite rod. Make it the least bit oversize to start with. Whenever possible, I like to have the fisherman in my shop when I shape the grip. We take a little off, then he tests it. We keep this up until he feels it is possibly a tad oversize. I want him to fish the rod at least once before he comes to the conclusion that he wants

Fly rod with a fairly straight-shaped burnt cork grip inlaid with regular cork, skeleton seat, wood insert, and wood button.



Lightly contoured fly-rod grip has a small diameter for the author's small hand. Inlays are burnt cork.

me to take off a tiny bit more. Obviously, it's easy to reduce diameter, but I can't add it back on without tearing the rod apart.

Length is also going to vary with the size of the fisherman's hands, but it is also a factor of where he holds the rod (with *his* reel and line) for the most comfortable balance. Another factor is how much during a day's fishing does he shift the position of his hand on the grip. Most people do so without realizing it and they do it to shift balance. In this way, different muscle groups are put to work while others get a chance to rest. From my experience I've found that it is almost always best to make the grip about ½ inch to one inch longer than the angler thinks it should be.

The shape of the fly grip was covered in *Shaping cork grips* in the preceding chapter. I'll just briefly repeat here my personal belief that grips specifically contoured to fit the caster's hand end up tiring and cramping the hand. Simple shapes allow the hand to "walk" around the grip, thereby relaxing it.

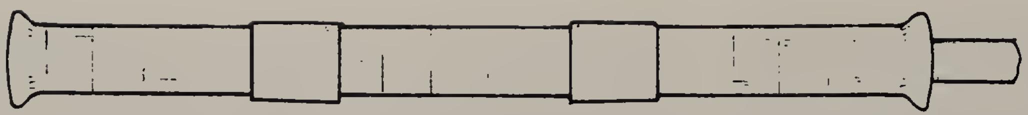
Other considerations already covered are regular down-locking or up-locking seats and small fighting butts, both detachable and permanent.

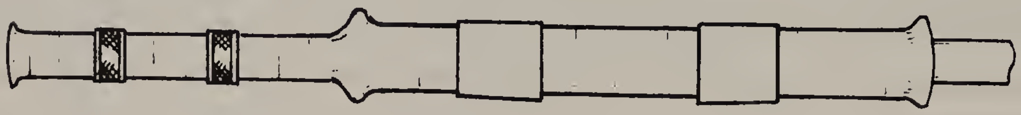
With regard to grip cosmetics, there are some limitations. Obviously, you do not want to put wood and plastic trim on that portion of a fly grip where the caster's hand may rest. This kind of trim should be reserved for each end of the grip. On the other hand, you can inlay a cork grip with burnt cork or with resilient grip and locate it wherever it looks best, even if it is directly under the hand. That is one of the advantages of these materials.

COMBINATION FLY/SPINNING-ROD HANDLES

In recent years there has been a tremendous increase in the number of people involved in hiking and backpacking. Existing sporting-goods stores have added whole new departments, and new stores devoted exclusively to this interest have opened. A great many of the devotees are fishermen who want combination fly/spinning backpacking rods. Blank manufacturers have responded with multisectional blanks designed for this purpose. It should be mentioned that the market is not limited to backpackers. Often a fisherman wants a combination rod that breaks into small enough sections so that it can be kept in the car on a more or less permanent basis. Then if during his travels he encounters some fishable water, he is always equipped. It falls to the custom rod builder, however, to design handles ideally suited to each specific rod and the needs of the particular fisherman.

One of the simplest designs is a long, straight cork handle, flared slightly at the ends and equipped with sliding spinning-reel bands. Generally this is about 12 inches long. When a spinning reel is used it is mounted near the middle, or at the point of preferred

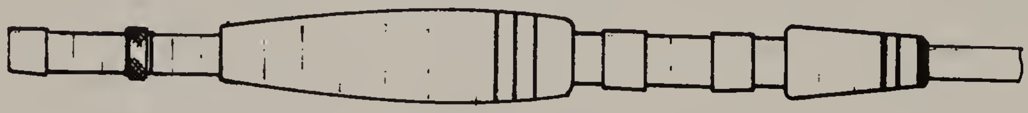




Above: Straight cork combination fly/spinning handle.
Below: Reduced diameter for fly reel.

balance, in the conventional manner. When the angler switches to fly fishing, the fly reel is mounted as far to the rear of the handle as possible. The remaining cork in front of the reel then serves as the fly-rod grip. This is a functional design in most cases, provided the thickness of the reel feet of the fly and spinning reels is the same. One problem frequently experienced is that the fly reel, with shorter feet, tends to twist or move around the handle. The larger diameter of the cork required for the spinning bands is not ideally proportioned for a good fit of the fly reel.

In an effort to provide a more secure and proportionately designed mounting for the fly reel, the butt end of the handle can be changed. The diameter of approximately the rear 4 inches is reduced to the size normally used for an all-cork fly-reel seat. One side of the cork is filed flat to provide a seat for the fly reel, and sliding fly-reel bands are installed. The balance of the cork handle is of the necessary diameter for spinning-reel bands.

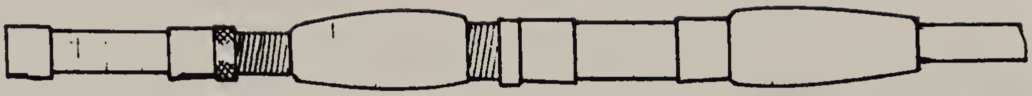


Fixed hood and single reel band for fly reel.

A variation of this design is to use a fixed fly-reel seat hood (or pocket) on the extreme butt, and one sliding fly-reel band. Both of these arrangements are an improvement, since the fly reel has its own secure seat. Fishing with one of these handles will reveal a distracting and disturbing aspect, more irritating to some than to others. The sliding bands of the "seat" not in use will click together—constantly. A small piece of wood or plastic can be fashioned with a taper on each end. This simulates the reel feet, and the bands of the "seat" not in use are slid over this piece. As long as this piece is not lost or misplaced, the annoying clicking noise is eliminated.

For slightly heavier rods where a more secure mounting for the reels is desired, or in an attempt to eliminate the clicking together of sliding bands, fixed reel seats can be used. Skeleton seats with the metal center barrel removed are often used. They can be made from all-metal seats or purchased. You will need a fly-reel seat and a spinning-reel seat. To keep the assembly light in weight, the centers of each seat can be made of cork. Some rod builders feel the weight savings of skeleton seats are negligible and use all-metal seats for this assembly.

Any of the combination seats described can be built from cork rings directly on the

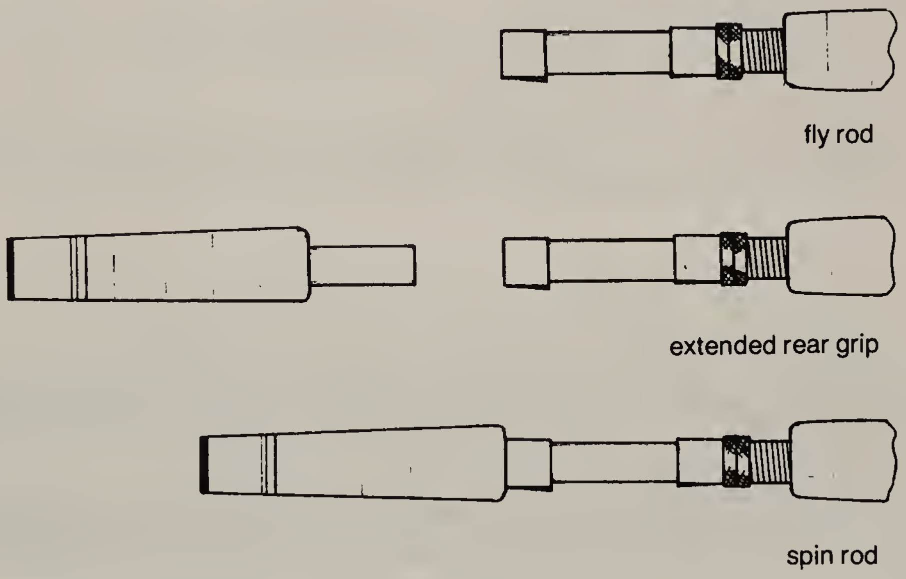


Fly and spinning skeleton seats with cork inserts.

blank, or the individual sections can be preformed separately. These are then taper-reamed and glued on the blank. Remember that when sliding reel bands are used, the cork section over which they slide must be made in two sections to permit the bands to be fitted and slid onto the cork.

RodCrafter Norma Stirrup came up with another solution to the problems of a handle assembly for the combination fly/spinning rod. Basically, she built a conventional fly-rod handle of cork grip and fly-reel seat. Then a detachable rear or butt grip of the type usually found on spinning rods was designed so that it would slide inside the open-ended fly-reel seat. The construction techniques were similar to those used in making a detachable fighting butt for a fly rod. In this case, the detachable section was in reality the butt grip of a spinning handle.

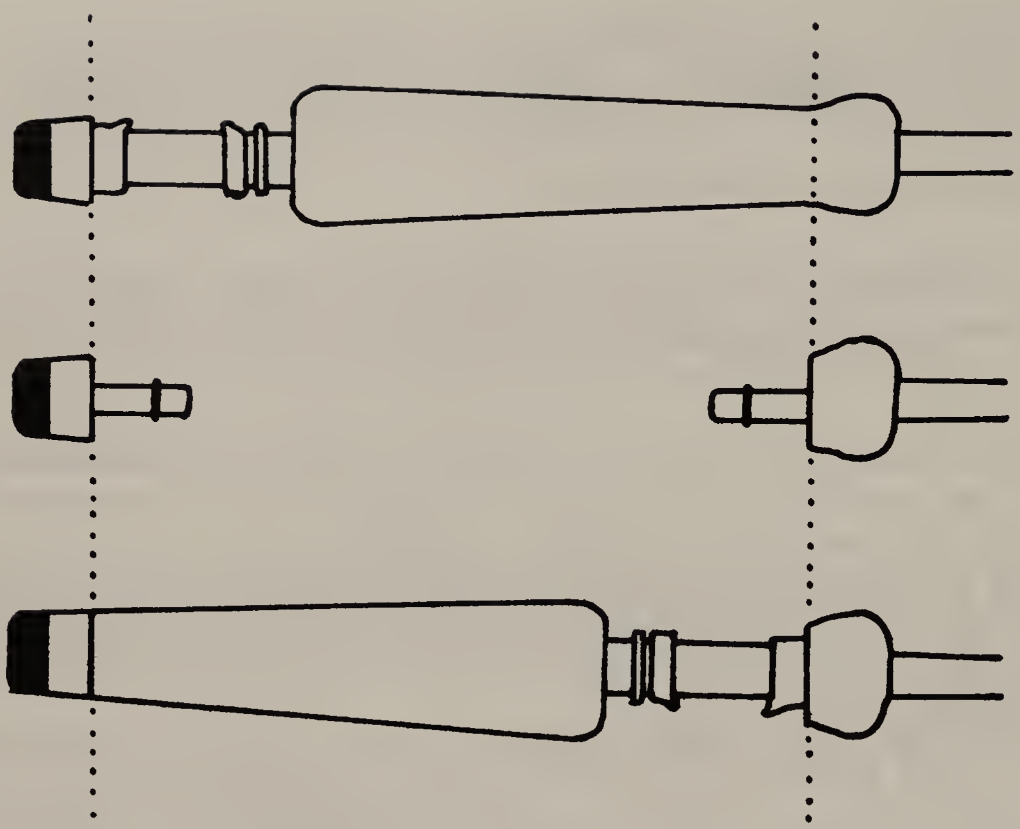
She started with a fly-rod blank slightly longer than desired and cut a short piece off the butt. A suitable piece of scrap blank that would fit inside the taper of the butt of the rod was selected. If a piece of hollow fiberglass is not available to fit, a length of solid fiberglass can be used, and one end tapered. She now had a piece of fiberglass with a male "spigot" or plug ferrule on one end. On the lower end of this piece was built a rear spinning-rod grip. When the rod is used in the fly-rod mode, the rear grip section is carried in the pocket or the pack. When the fisherman switches to a spinning reel, he merely plugs in the rear half of the spinning grip for a comfortable, normal handle.



Detachable rear grip converts fly handle to spinning handle.

When making this handle it is important to select a reel seat with hoods large enough to hold both the spinning-reel feet and the fly-reel feet. Assuming that an ultralight spinning reel will be used, this should not present a problem with one of the larger-diameter fly-reel seats. However, check both reels before starting.

RodCrafter Martin Clark took another approach to the design of the combination-rod handle assembly. He says he went back to functional basics, reasoning "that on a fly rod



Combination fly/spin seat built around metal ferrules.

the long grip had to be in front and the reel seat in back. On a spinning rod the seat is usually a bit forward and the longest portion of the grip (butt grip) was behind the seat. In the Pacific Northwest [where he lives] the foregrip on most freshwater rods is so short as to be almost nonexistent."

After viewing the above requirements, it just seemed natural to him to work out a handle design where the reel seat and long grip were reversible, as in the drawing. These two components forming the bulk of the handle are built on aluminum tubing or a length of scrap blank. Inside each end, the female portion of a metal ferrule is mounted. The male portions of the ferrules are mounted on the butt of the rod blank and the short butt cap section.

Ideally, the ferrule size is the one where the male portion fits perfectly over the butt of the blank. However, metal ferrules are becoming increasingly difficult to find in all sizes. As long as the male ferrule is big enough, it can be shimmed if need be. The only restrictions on ferrule size, then, are: (1) the male section has to be big enough to fit over the butt of the blank, and (2) the outside diameter of the female section has to be small enough to fit inside the reel seat and the piece of scrap blank or aluminum tubing. Bushings and shims, where needed, would be of the usual types used with reel seats, etc.

There is a fair amount of stress on the end of the blank where it plugs into the reversible handle. Even though this is a light pack rod, the blank should be reinforced. Martin does this by inserting a scrap piece of fiberglass blank *inside* the butt of the blank. The taper has to reasonably match the inside taper on the blank, and the length should be two to three inches. The small end should be rounded to eliminate any possibility of a shear point. Slow-cure epoxy is used and the reinforcement made before the ferrule is attached.

Care must be taken in the selection of a reel seat since it must securely hold *both* a fly reel and an ultralight spinning reel. Best results will probably be obtained with a moderate-sized fly seat (end button removed) or small spin seat. The Fuji seats fit a wider range of reel-feet sizes, and a size 16 would be a good place to start.

When shaping the front part of the cork grips on the handle, attach it to the blank in the "fly" configuration. Then sand the cork so the piece on the butt of the blank blends in perfectly, keeping in mind that you must fit the hand of the person who will fish the rod. When sanding the rear portion of the grip, attach it in the "spin" configuration and blend in the lines to the butt cap.

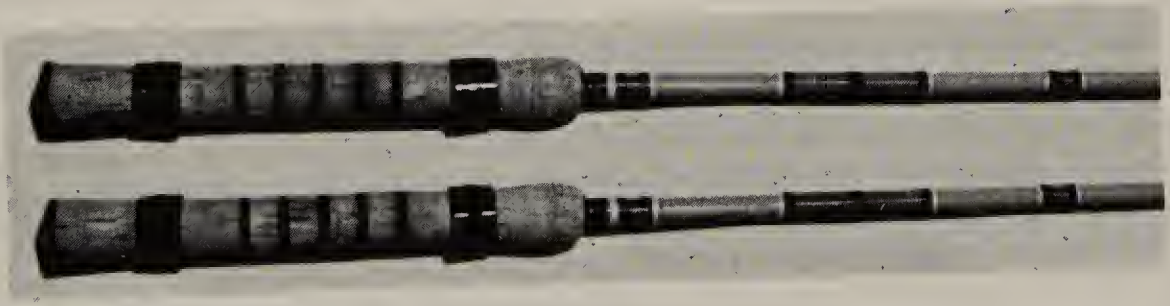
SPINNING HANDLES

When spinning was first introduced in this country from Europe, all the rods had handles of straight cork grips equipped with sliding bands or rings to hold the reel. Perhaps the greatest advantage of this handle was that it enabled the fisherman to mount the reel at any point along the handle. He could thus achieve a balance that was most comfortable to him. He could also move the reel to the front of the grip when casting heavier lures, and toward the butt of the handle when working with the lightest lures. Both adjustments helped in casting control. If he switched to a spool of heavier or lighter line he could also move the reel to the best position to eliminate or minimize line slap. The handle design really gave the knowledgeable angler an element of control over his equipment to make it perform to best advantage in different fishing situations.

On the negative side, the sliding bands often tended to loosen while fishing. This was due to a lack of friction between the reel foot and the cork, and between the sliding bands and the cork. A contributing factor to the problem was that after long usage, the cork often became compressed, and the sliding bands therefore worked loose more easily. As a result, American rod manufacturers switched to fixed reel seats on many spinning rods.

RodCrafter Harry Crusenberry recognized and preferred the advantages of the straight handle and sliding reel bands. Of necessity, he developed a handle design that, in his words, "holds the reel like a leech." In the process he not only eliminated the problem of the spinning rings working loose, but he was able to add custom color-coordinated trim to his rods.

His approach was to include soft rubber washers between the cork rings on that portion of the handle where the reel might sit. The friction between the rubber and the reel foot does away with all movement. Both the reel feet and the sliding bands stay in place.



Rubber-inlaid spinning handles to grip reel feet.

Harry's method for making the grips was detailed in the original edition of this book. The soft rubber rings were either hand-fabricated from washers or cut from sheets of rubber. These rings had to be ground to the finished size before they were glued with the cork rings onto the blank. The cork was then sanded down carefully to the size of the rings. At best, it was a fairly difficult handle to make and have look really good—but it did the job for which it was intended.

Today it is much easier to make this type of grip by replacing the rubber rings with Customgrip II. As we have discussed in the last chapter, it and cork abrade at very nearly the same rate and can be shaped simultaneously. If you want the resilient grip material to be just slightly higher than the cork it's easy to accomplish.

The handle can be made much more attractive by inlaying not just individual rings, but checkerboards, triple rings, and all kinds of designs. The entire length of the straight cork grip can serve as a background for any kind of graphic statement the creative rod builder wants to make.

Both ends of the grip are swelled to a slightly larger diameter to prevent the sliding reel bands from coming off. Generally, half to three quarters of the grip, including resilient trim, is glued to the blank. It is then shaped, using the reel bands as templates. The reel bands are slid onto the completed section and the parts for the remainder of the grip are glued to the blank. I usually anchor the metal sliding bands with masking tape so they will not move about while I turn the last portion of the grip.

The resilient grip material, if not too soft, also makes an excellent handle of this type for spinning. It definitely holds the reel bands and the reel itself. You can buy one-piece grips made of resilient material. Before mounting, force the sliding reel bands over the slightly swelled end. If you make this handle yourself entirely of resilient material, use calipers to turn the mid-section to the desired taper. Swell the ends less than you would with cork, then force the reel bands over the end and finally mount on the rod.

The design of this handle does work extremely well and, as Harry said, "holds the reel like a leech." Beautifully color-coordinated handles, with or without cork and either bright or subtle, can give the rod a definitely custom appearance.

Fixed spinning-reel seats

The typical spinning-rod handle assembly is made with a fixed reel seat rather than the sliding bands used mostly on ultralight rods. In back of the reel seat is the butt grip and in front is the foregrip. On this type of rod the fisherman doesn't hold the grip but instead grasps the reel seat with the reel stem between his fingers. The size (diameter) of the reel seat selected should be the one that most comfortably fits the fisherman's hand. Quite a few people prefer a seat slightly larger or smaller than the size they find on a factory rod. Of course, the seat must also be of a size that will hold the fisherman's reel securely, and reel feet do vary.

Aluminum seats are colorful, but they usually are available in a very limited number of sizes. Fuji FPS seats, by comparison, are made in two-millimeter increments from size 16 to 32. Also, when you find the FPS seat that best fits the hand, the chances are excellent that the reel feet will fit the nylon-lined seat hoods. With aluminum seats, it is always necessary to check before mounting.

There is no "right" way to orient the reel seat on the rod, up-locking or down-locking. The sliding hood and nut can be at the butt end or the tip end, whichever is most comfortable to the person fishing the rod. For example, my thumb and index finger tend to get numb or "go to sleep" when I do a lot of casting. I can counter this by rubbing them on the knurled nut if I orient the seat with the nut towards the tip.

Other comfort aspects should be considered. If the rod is going to get a lot of cold-weather duty, you can utilize a design that will minimize hand contact with cold metal. A skeleton seat can be used with a cork or resilient grip insert. The fixed hood can be recessed beneath cork as explained for fly rods in the chapter on reel seats. To cover the cold reel stem and feet, an inexpensive vinyl gadget made by Fuji can be used.

Since the fisherman holds a spinning rod by the reel seat, the length of the butt and foregrips may seem to be solely a matter of cosmetics. Not so. A lot of factors may determine the length of the grips on each rod, and a good rod builder is aware of them.

Let's start with the length of the butt grip. For any given rod, reel, and fisherman combination there is an optimum balance. The point around which that balance pivots, or if you prefer, the fulcrum of the lever, is the point where the angler holds the rod in casting. On a spinning rod, that happens to be exactly the same spot as where the reel is located. Therefore the position of the reel seat, and its orientation, is one of the first steps in designing the handle. I include orientation because most seats are about five inches long and the reel, when mounted, is at one end of the seat—the end with the fixed hood. The other end, with the sliding hood and nut, can be located forward or rearward, as desired, as long as the reel itself is located at the desired balance point on the rod.

Some fishermen can locate the point where the reel balances best just by holding the bare blank or the blank with a heavy tip-top taped on the end. The latter simulates guide weight and helps bring out the action of the blank. Occasionally, it may be necessary to tape the guides in rough position and mount the reel that will be used with the rod in the reel seat. The seat can then be slid over the butt of the blank and temporarily taped in various positions until the correct one is found. Each end of the seat is then used as a template to lightly score a line around the blank.

It should be mentioned here that once in a while the optimum balance point for the seat is so far forward on the blank that it makes the butt grip too long and unwieldy for comfortable casting. In that case the seat should be moved rearward until the butt grip is a comfortable length. Weight is then added at the very butt end of the blank to counterbalance the tip weight of the rod forward of the reel.

The subject of counterbalancing was discussed near the end of the chapter on blanks. Using the techniques explained there, you can produce the desired balance in a rod when the length of the butt grip has been fixed by some other consideration.

One such consideration may be two-handed casting. If the angler wants to be able to give the cast the extra snap possible only when using both hands, the butt grip must be long enough. Then there is the comfort consideration in fighting a fish. When large fish are the quarry, the rod builder needs to know how the rod will be braced and held when a fish is hooked. If the rod is braced in a low-slung fighting belt, the butt grip will have to be longer than if the rod is braced higher, against the stomach. Arm length even comes into play here, and the fisherman will have to hold the blank in his fish-fighting position to determine the position of the reel seat.

Another consideration with some rods is to have the butt grip of a length that will let it rest comfortably against the arm when playing a fish. The modern long and light steelhead rods initially developed in Michigan are of this type. They are very long shock absorbers built for light line of two-pound to six- or eight-pound test. Casting is secondary to fish-fighting. When a fish is hooked, the angler holds the rod so that the butt extends along, and rests against, his forearm (there is even a special "forearm" butt cap.) If the butt grip is long enough, almost to the elbow, then the weight of the rod and fish will be distributed evenly and comfortably along the arm. The fisherman will have good control.

The same concept to varying degrees can be important in other kinds of rods. For example, many knowledgeable bonefishermen working the Florida Keys prefer to hold their rods above their heads when a fish runs. This is to keep the fragile line from cutting on coral and a host of bottom creatures and clutter. If the butt grip is too short, all the pressure must be born by the wrist. A much more comfortable rod is one whose butt grip is long enough to be braced against at least part of the arm.

Yet another consideration may affect the butt-grip length if the rod is often placed in a boat's rod holder. There is a whole school of anglers out there who grew up on spinning rods. When they moved into boat fishing and trolling, some of them continued to prefer spinning rods over revolving-spool boat rods. If a butt grip is not long enough for the butt cap to rest on the bottom pin inside the holder, the spinning reel will be scraping on the boat's gunwhale. When the rod builder knows the rod will be used in this manner, he can make the butt grip long enough. He can also use a soft gimbal-base rubber butt cap to keep the rod from swinging and rotating in the holder.

What about the foregrip? On many light freshwater spinning rods it is essentially cosmetic. On many other spinners, especially saltwater, it is quite functional. While fighting a fish, the reel is locked in anti-reverse, the drag carefully set, and the hand moved up onto the foregrip. There, it provides more leverage and there it is a heck of a lot more comfortable than straddling the reel stem. So, if the foregrip is to be functional, we need to fit it to the fisherman's hand.

Personally, I like to see at least a few inches of foregrip on all but the lightest of spinning rods just in case an unusually large fish is hooked. This stems from a Washington State encounter with a 32-pound spring-run Chinook while fishing for steelhead. The rod (this time not mine) was a standard Northwest type with a one-inch foregrip. The only place to hold the rod during the fight was the bare blank above that tiny foregrip. Even my small hands cramp in that kind of situation.

These are certainly not the only considerations in determining the length of the grips and the placement of the reel seat on a spinning rod. In the normal course of events they may be the most important ones. A rod maker, or more accurately, a custom rod builder, must learn never to take anything for granted or to assume anything about the fisherman and his fishing. Only by exploring all areas can we truly fit the rod to the angler.

Sensitivity

One of the first noticed attributes of graphite rods was the increase in sensitivity. Fishermen could better feel what was happening to the rod and at the end of the line. This was an obvious advantage. Soft pick-ups and nibbles by the fish could be detected more easily, and plastic-worm fishermen could tell what kind of bottom they were moving the worm over. About this time, salesmen designed all kinds of tricks and tests that would show their rods to be more sensitive. I recall one AFTMA show where a salesman thrust a rod into my hand and placed the tip on his Adam's Apple. He proceeded to talk to me, explaining that I could feel the vibrations from his voice box in my hand because his rod was so sensitive. Even wilder gimmicks were used, and some of the claims and counter-claims became almost laughable.

Sensitivity in a rod is largely a matter of the stiffness-to-weight ratio. If you can make a blank that weighs less, yet has the same or an improved stiffness profile, it will be more sensitive. That, basically, is why a given graphite rod is more sensitive than the same rod in fiberglass. It is also why an ultralight graphite spinning rod is more sensitive than a medium or heavy graphite spinning rod.

Let's clear up one myth about graphite. There is nothing magical or unique about graphite that enables it to transmit vibrations better than other materials. It is not, for example, comparable to the conduction of electricity where silver and copper are excellent conductors but glass is an insulator. Some people even believe you can chop graphite fibers into particles, or grind it into granules, and add it to epoxy glue, thereby enabling vibrations to pass more easily through the glue joint! No way. Yes, chopped graphite fiber is an excellent reinforcing filler in plastic resin to make a lightweight reel seat or trigger or fly reel, but it does not make those objects "better transmitters of vibrations"—or more sensitive. All it does is make them a bit lighter and stronger than if they were made of the plastic resin alone.

Over the years, a great many ideas on sensitivity were shared and debated by RodCrafters both in the pages of the *Journal* and at the many seminars held throughout the country. We were all aware of the increased sensitivity of graphite, but RodCrafter Joseph Ruzich was the first to propose that we might be able to do things in the construction of a rod to enhance the sensitivity in the fisherman's hand.

His work was with casting rods. Very briefly, he removed the bottom of the adapter between the butt of the blank and the inside of a Fuji graphite (filled) handle. He then did everything possible to get a square, tight fit of the end of the blank to the handle. He also used a single-foot guide in place of a glue-on tubular tip-top, and wrapped it onto the blank with no glue between the guide foot and the scraped-bare graphite blank. He developed a touch test to compare a rod so modified with an identical rod not modified. The tests showed most people could feel a lighter touch more often with the modified rod—proving it was more sensitive.

This was presented at a RodCrafter seminar in early 1979 and in the March, 1979, issue of the *Journal*. Joe was swamped with inquiries. It worked for some people but didn't for others. He wrote a "revisited" article that appeared in November, 1979, explaining in more detail his modifications. However, he also pointed out that he was using these techniques on ultralight and very light casting rods designed for six- to eight-pound test line and 1/8- to 1/4-ounce lures. Of the four blanks he used, the two stiffest (Childre) were also the lightest. They worked slightly better than the softer blanks (Lamiglas). The people having the poorest results, it seemed, were often those using heavier blanks for heavier lure weights. At the time we were all caught up in the idea that we, as custom rod builders, could improve the sensitivity of a graphite blank—which was pretty heady stuff. In retrospect, I feel we missed the most significant fact: *The lightest-weight blanks with the highest stiffness profile were the most sensitive.*

I bring all this up to try to give the reader an understanding of the climate that existed for quite a few years and still does in some quarters. We all thought graphite was a miraculous material and we wanted to use it to its fullest, even improve on it if we could. We eventually discovered that some of the things attempted had no effect on sensitivity. Unfortunately, not everyone learned of these findings, and erroneous information persists.

There was so much misinformation flying around that a few years later RodCrafter Fred Stevenson, himself an engineer, conducted some very meticulously controlled tests with Dr. Don Wallace, Professor of Mechanical Engineering at the University of Alabama. The purpose of the tests was to determine the effects of guides, especially underwrapped guides, on rod sensitivity. Very briefly, an accelerometer was used to detect vibration at the handle end, and a storage oscilloscope recorded it. A rod was tested first with no guides on it, then with guides, and finally with underwrapped guides. There was no meaningful difference between them—yet some people today believe a rod with underwraps is not as sensitive as one without.

About a year later, Fred used the same laboratory and physical set-up to conduct tests on different handle assemblies and handle materials. Here there were some differences, but it was *unclear whether the magnitude of the difference was great enough to be felt by even a skilled fisherman.* The softer resilient grip material did not do as well as cork. But surprisingly, a hollow graphite Tennessee handle supported by high-quality graphite bushings (not filled graphite) did not do any better than cork. A reel seat with hardwood bushings tested about the same as one with cork bushings.

A somewhat similar set-up was used later at a seminar in Oakland, California.

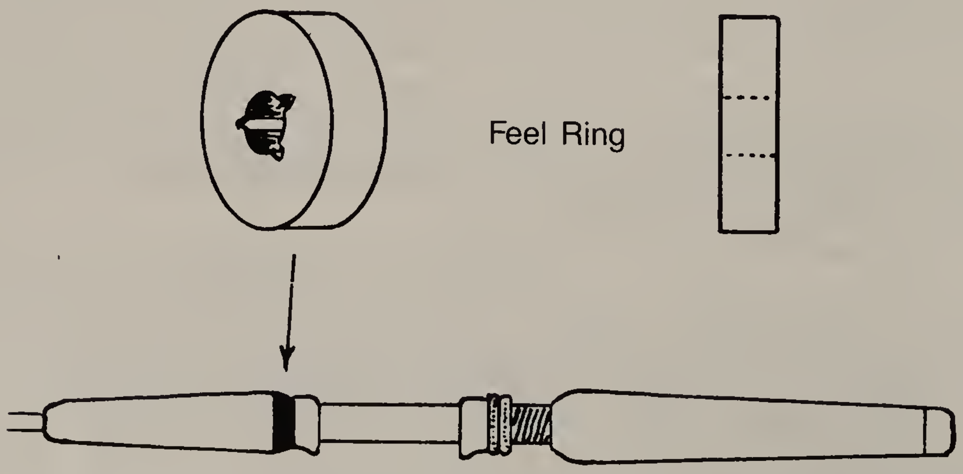
RodCrafter Steve Volkers provided a machine with three accelerometers and three storage oscilliscopes. Three different parts of the rod could be tested at the same time and the readings compared. The results were far from conclusive but tended to support what Fred had determined under more controlled conditions. Interestingly, the bare blank just above the handle assembly tested only marginally better than the cork foregrip. However, we could not determine if the *difference* was great enough to possibly be felt by a fisherman.

Keep in mind that all of these tests showed readings *only on the specific rods tested.* No one can say that other models or makes of rods would have tested better or worse, or even that duplicates would have tested the same.

Individual RodCrafters have been incorporating various construction methods and materials into their rods in an attempt to increase sensitivity. Some of us do so in the hope that it might work; others have stronger convictions and will swear that what they do definitely works. We can't even begin to report on all these ideas here. Throughout the book there are comments relating to certain materials or methods and sensitivity. Here, under spinning rods, we'll look briefly at two ideas. I selected these because some rod-company advertising types have been at it again. Now they are touting handleless rods whose swollen butt blanks are in direct contact with the hand, and therefore more sensitive.

My own suggestion regarding techniques to improve sensitivity is to give an idea a try if it seems to make sense to you. Then test it yourself in a real-life fishing situation. If you sell your rods, you might seek the feedback of your customers, or then again you might not. An interesting thing happens when we are testing a rod or when we are fishing with a rod that we believe to be superior—we are more attentive and we concentrate more on our fishing. And when we do that, we enjoy it more and usually increase our catch.

RodCrafter Boyd Dingledine builds mostly open-face spinning rods for steelheading in the Michigan area. Since the fisherman is holding the reel seat, this is where he will feel or not feel the vibrations transmitted up the line to the tip. Reasoning that these vibrations must pass from the blank through the two reel-seat bushings and then through the seat walls, Boyd tries to use high-density bushings. He originally used hardwood but has since switched to lighter-weight Sensitron material. He also scrapes the finish from the blank beneath the reel-seat bushings and files the holes on the bushings for a tight fit on the blank. Using a triangular file, Boyd cuts three keyway slots on the inner rim of each bushing. Epoxy glue will fill these triangular slots, helping to hold the bushing. These are important because the fit between the bushing and the blank is tight enough, by design, to squeeze out most of the epoxy.



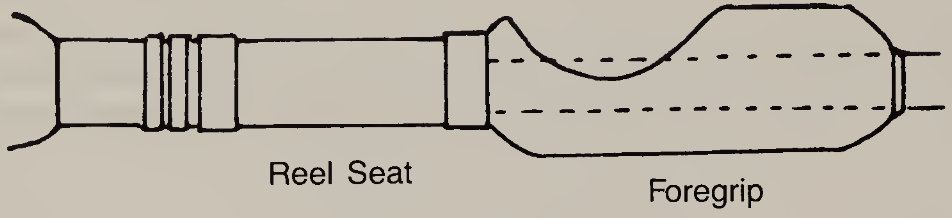
Steelhead spinning rod has a "feel ring" of lightweight, rigid material to help the angler detect strikes.

The same procedure is followed in fitting and mounting the reel seat to the outside of the two bushings. The basic idea is to use lightweight, high-density materials with as little glue between surfaces as possible.

Boyd noticed that many anglers using open-face spinning reels tend to place their thumb and/or their index finger on the bottom (or near end) of the foregrip. He decided to mount his reel seats "up-locking" so the fixed hood would be at the top or front of the rod and the reel would hang beneath that portion of the seat. This encouraged placing the thumb or finger on the foregrip as noted above.

Between the seat's fixed hood and the foregrip, Boyd mounts a 1/4-inch to 3/8-inch ring of high-density material. He calls this a "feel ring" that transmits vibrations from the blank to the angler's thumb or finger. For the ring he has used hardwood or Customwood. Fitting and mounting is done in exactly the same way as for the seat bushings. He believes that he and his customers now have a better feel of the bottom, so important in steelhead drift fishing.

RodCrafter Al Romani also noticed that fishermen using open-face spinning rods tended to have direct contact with the near end of the foregrip. He took a different approach, however. He creates a hole in the grip right where the angler's thumb is placed. The thumb then rests on the bare blank and should be able to feel all vibrations transmitted through the blank.



A shaped hole in a spinning-rod foregrip allows the angler to place his thumb in direct contact with the bare blank.

If a preformed cork grip or length of cork stick is used, it is very easy to cut the hole before the grip is glued in place. Don't use a knife or the cork may split. A round rotary rasp or grinding stone chucked in a drill is excellent. In like fashion, a plug cutter or drill can be used. A half-round rasp or file run across the axis of the grip works very well. After the hole is made, use sandpaper to shape and finish the hole. Start with coarse paper and progress through all grades to very fine. The firmer resilient grips such as Customwood II can be shaped the same way.

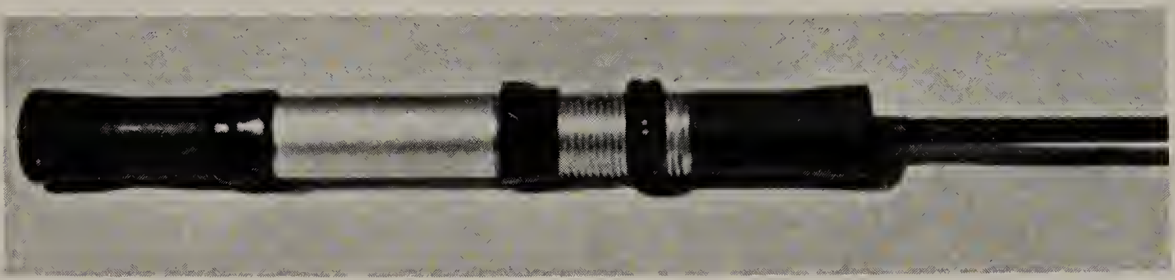
The blank beneath the hole can have the finish removed by scraping, then fine sanding before the grip is installed. Immediately after the grip is mounted, the bare blank in the hole should be wiped clean of epoxy using a rag moistened with solvent.

If making the grip from cork rings, first fit each ring in place on the blank and number them. Remove them from the blank and glue the first three together. When dry, make your hole as above and glue your 1 1/2-inch preformed section to the blank with the other rings.

Wood spinning handle

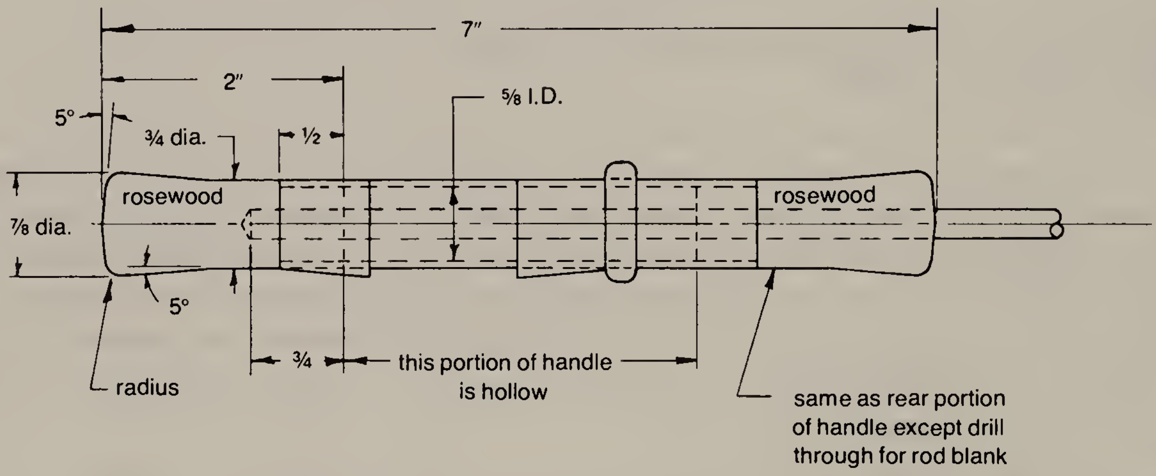
Let's turn our attention now to a unique handle design using a fixed reel seat. The grips on most light freshwater spinning rods are usually made of cork or resilient material. A few creative RodCrafters are not tradition-bound. Ben Ritenour and Michael Grimshaw, to name two, built some of their rods with hardwood grips. Although a bit heavier than cork, these rods don't *seem* heavier because the weight is practically in the hand. The feel or balance of the rod has not been changed. Mike developed a short hollow-wood handle assembly of custom beauty that can serve as a model from which we can learn various techniques. He chose rosewood for the butt and foregrips, but any interesting hardwood could be used.

The handle built to Mike's dimensions is surprisingly light and was first employed by him on a Fenwick HMG graphite blank, Model GSP541. Weight was kept to a minimum by the short length of the grips, the hollow construction, and a small reel seat. The sizes of all the parts are comparable to those used in ultralight rods.



Grimshaw's finished handle.

In the accompanying diagram, it is clear that no cork arbors or reel-seat bushings are used. Instead, the reel seat is supported on each end by a ½-inch-long tang, or turned-down recess, in each wood grip. Nor is there a butt cap or winding check. The simple beauty of the wood stands by itself, accented only by the reel seat.


7"
2"
5°
¾ dia.
½
⅝ I.D.
rosewood
⅞ dia.
5°
radius
¾
this portion of handle is hollow
rosewood
same as rear portion of handle except drill through for rod blank

Wood ultralight handle.

The wood grips are each turned on a lathe from blocks 1 × 1 × 2 inches. They are identical in shape except that the foregrip is bored all the way through for the blank. The rear grip has a blind hole only ¾ inch long into which the butt of the blank is epoxied. The end of each grip is flared to a diameter of ⅞ inch. The diameter of the balance of the grip matches the barrel of the reel seat.

When the grips are turned on the lathe, the shape and outside diameters are first developed. Calipers are used to match the outside diameter of the grip to the outside diameter of the reel-seat barrel. Smoothing is done with progressively finer sandpaper, ending with 400 grit. Next, the ½-inch-long recess on the end of the grip is turned. The reel seat must just slip over this tang for support and to keep all parts aligned and centered. When all the parts are fitted, they are assembled with epoxy glue.

The finish used on the wood is a matter of personal preference, but it must be an exterior type that will withstand the elements. In the case of rosewood, it can just be burnished, if desired. This is possible because of the natural oils in this wood. Burnishing is accomplished by revolving the rosewood at high speed in the lathe, and holding a piece of soft pine against it. A smooth, polished finish will result.

CUSTOM HANDLE TRIM

We've discussed the primary functional considerations involved in the design of fly-rod and spinning-rod handle assemblies. These are the things that enable us to truly fit a rod to a specific fisherman and his particular needs. We've also just seen where a handle can depart dramatically from the usual, but still be completely functional. In the last chapter we explored some of the decorative things that can be done with resilient grips and with cork/resilient grips. In this section, let's focus our attention on other ideas and techniques that can enhance the appearance of a handle asembly.

Cork handle assemblies are frequently inlaid, not only with resilient material and burnt cork, but with "hard trim" as well. This trim would include hardwood, resin-impregnated wood, and plastic. It may take the form of a simple trim ring or it may be fabricated into hosels and butt caps. The basic techniques for making and using these accent pieces are covered in detail in *Fiberglass Rod Making.* Reel-seat inserts are covered there also, and in this book in the chapter on reel seats.

Wood and resin-impregnated wood

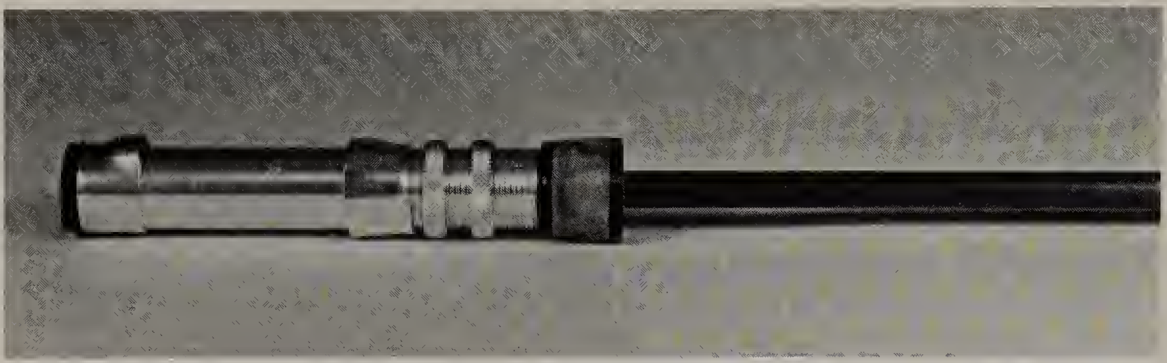
An especially good-looking bit of trim can be made by combining a 1/2-inch wood trim ring with a pair of plexiglass rings, one on each side. These can be preglued, then shaped as a single piece for a hosel or butt cap (with a metal butt plate on the end).

This can also be used as an inlaid trim ring wherever desired in the grip, either as a 1/2-inch or 1/4-inch wood center. This sandwich of plexiglass-wood-plexiglass gets back to the graphic appeal of our "rule of threes." I have also found that in a great many cases it looks best when the plexiglass is quite thin, 1/16 inch. The proportions are more dramatic and the attention is focused on the grain of the wood.

Another very handsome design for a spinning rod is to bracket the reel seat with a pair of 1/2-inch or 1/4-inch wood trim rings. The rings are shaped so they are tapered

Walnut trim ring (1/2 inch) is bracketed by black plastic trim rings (1/8 inch glued in place.

Hosel is shaped on lathe.



Glued in place on blank and ready for cork rings forming grip.

slightly and rounded on the edge next to the seat. They can be sandwiched between plexiglass rings or used plain. When the reel seat has a matching wood insert, the overall effect can be terrific. The seat parts appear to be inlaid into the wood. Incidentally, this design looks equally good with cork or resilient grips.

I've been using the term wood, but I definitely am including resin-impregnated wood such as Customwood. Most rod builders prefer it because it is waterproof and can never warp, is stronger than steel, and has the finish (resin) completely within it. No finish is ever used on it, just buffing. If the piece ever gets scratched it can be restored to like-new condition by simply buffing. This is such an important form of wood for the rod builder that we will discuss how to polish it for various effects.

Hosels made of laminated resin-impregnated wood and plastic.

After shaping the piece, use 300-400 grit sandpaper to completely remove any scratches from shaping. You are then ready for buffing.

Three different polishing-rouge compounds can be used with resin-impregnated wood: (1) White Diamond, (2) Black Emery, and (3) Red Jeweler's Rouge. They are normally used in that order. If you want a satin finish, use only the White Diamond. For more luster, follow with a buffing of Black Emery. A brilliant, ultrahigh gloss can be achieved by finishing with the Jeweler's Rouge. Progressing through all three will consistently produce the highest gloss. However, if you spend a bit longer at the sanding stage, possibly also using 600 grit paper, you can go directly to the Jeweler's Rouge for a high gloss.

If buffing is new to you, there are a few things to keep in mind. Use a separate buffing wheel for each of the different polishing-rouge compounds. The cloth wheels are placed on a drill chuck arbor and can be held in a lathe, electric drill, bench grinder, etc. The wheel is first charged by holding the block of rouge against the wheel while it spins.

The object to be polished is then held against the spinning wheel until the surface is polished and clear.

Resin-impregnated wood can be laminated and inlaid with contrasting material such as plexiglass for some very interesting results. RodCrafter Jack Justis has done some fascinating things with this material and demonstrated his work at numerous seminars. Another skilled RodCrafter, William Scherer, wrote in the *Journal* about Jack's "gun cylinder" method of producing checkered designs.

Start with 1⅛-inch diameter (dowel) resin-impregnated wood turning stock about two inches long. Centered on the end, lay out and scribe a one-inch-diameter circle. This circle is then divided into eight equal sections so that there are eight centers evenly divided as in the drawing (Fig. 1).

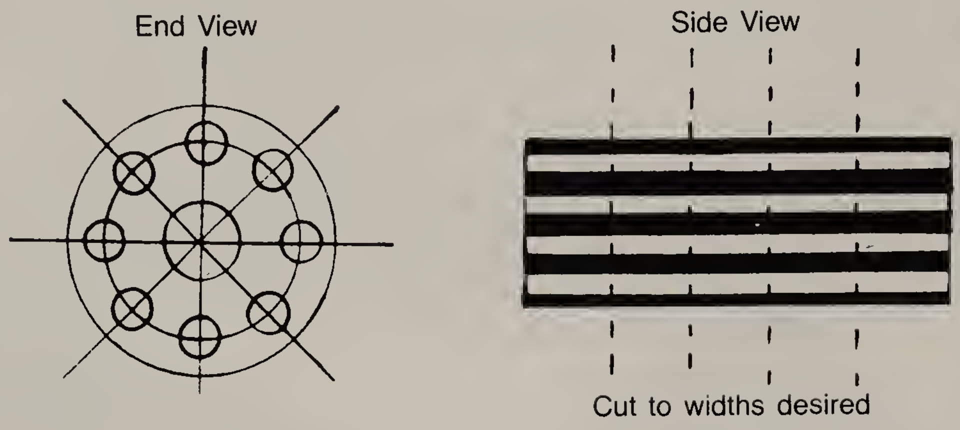


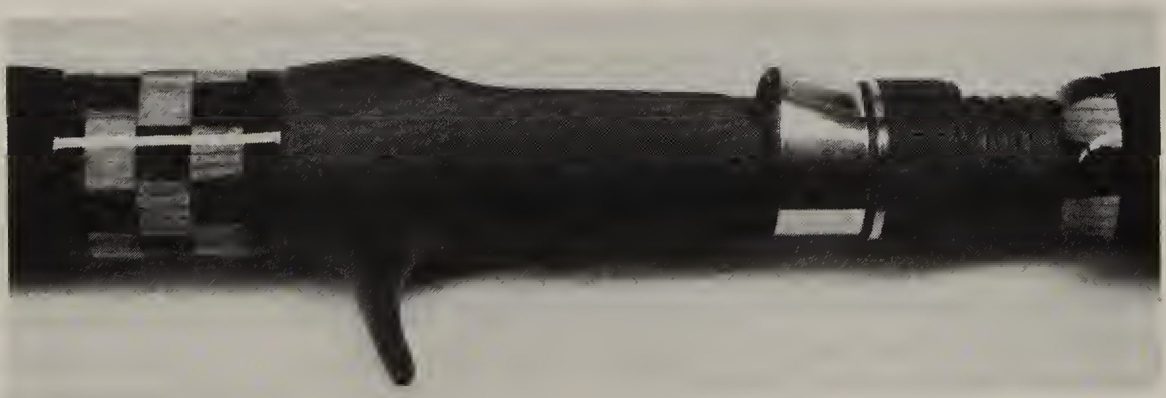
Fig. 1 Fig. 2

"Gun-cylinder" method of laminating wood and plastic to produce a checkered effect.

The center hole is drilled to whatever size is needed for the specific rod blank. Use a drill press with a vise on it to very accurately drill a 3/16-inch hole on each segment where the center line and the circumference line intersect. What you will have at this point is a piece that looks like the cylinder for an eight shot revolver.

The eight holes are next filled with 3/16-inch dowels of a contrasting resin-impregnated wood such as ebony. Or colored plexiglass or plastic can be used. The dowels are turned to size and glued into the holes.

After the glue has cured, the cylinder is fitted on a mandrel and chucked into a lathe. If the cylinder is turned to a diameter of one inch (actually .9554 inch) the surface area of



Inlaid checkered trim of resin-impregnated wood by Jack Justis brackets a Fuji trigger seat.

the wood forming the cylinder and the material forming the dowels will be exactly the same. Or, to explain it another way, precisely one half of each dowel will show as a contrasting stripe along the axis of the cylinder, and these stripes will be the same width as the cylinder walls (see Fig. 2).

To make a checkerboard design, the cylinder is cut into rings of the desired size. The rings are then alternately rotated one eighth of a turn as they are glued together on the blank. Perfect checkers are only one possible pattern. If you are willing to experiment, other interesting designs can adorn a rod.

Custom butt caps

Resin-impregnated wood or regular wood can be used to make eye-catching butt caps. These can be used alone in a handle assembly or with matching hosels and reel-seat inserts.

A common plastic butt cap is customized with a recessed metal butt plate (left). A slightly larger plate is used to finish a wood butt cap (right).

One style of butt cap was mentioned briefly earlier. It consists of a trim ring sandwiched between rings of plexiglass, then tapered slightly and rounded off on one end. To close the butt end, a metal butt plate is used. Instead of starting with a premade trim ring, you can use a longer piece of wood for a longer butt cap. The hole for the blank can be a blind hole and the outside can be cut so that the metal butt plate is recessed.

RodCrafter Bill Blount makes butt caps and sometimes matching hosels in a similar manner. Instead of purchased metal butt plates, he uses coins. There are many foreign coins with interesting designs such as ships, fish, and other nautical themes. Often they are available in sizes smaller than our dime, which is helpful. Bill points out that it is easy to get foreign coins from travelers and servicemen. Money exchanges operate only for paper currency and everyone returns home with left-over coins.

Measure the radius of the coin or other insert with a pair of dividers or a compass. Scribe this radius on the end of the wood piece while it is turning in the lathe. In that way you can very easily see the exact center.

Use a small cutting tool on a tool rest (or support of scrap wood) to cut from the center out to your scribed line. Cut to the desired depth but taper the edges. You want the opening for the coin wider at the bottom than at the top to help hold the coin in place. Bill cuts to the point where he can just "snap" the coin into place. Use 400 grit sandpaper to assist in the final fitting. If the coin does not go in far enough, check for a high spot of wood in the center.

Coins (from Hong Kong and Spain) recessed in wood for butt caps and hosels.

Roughen both the back of the coin and the wood and use slow-cure epoxy to glue the coin in place. If the butt cap has previously been mounted on the rod, make sure the coin is aligned as desired.

To make a matching hosel, you will have to drill out the center of a fully cured inlay. Select a drill-bit size to fit the blank. Use either a drill press or a horizontal boring tool on a lathe. The speed of penetration must be slow and backed off frequently or the epoxy will get too hot and the coin will break loose. If it does, finish drilling the coin and the wood separately and re-glue.

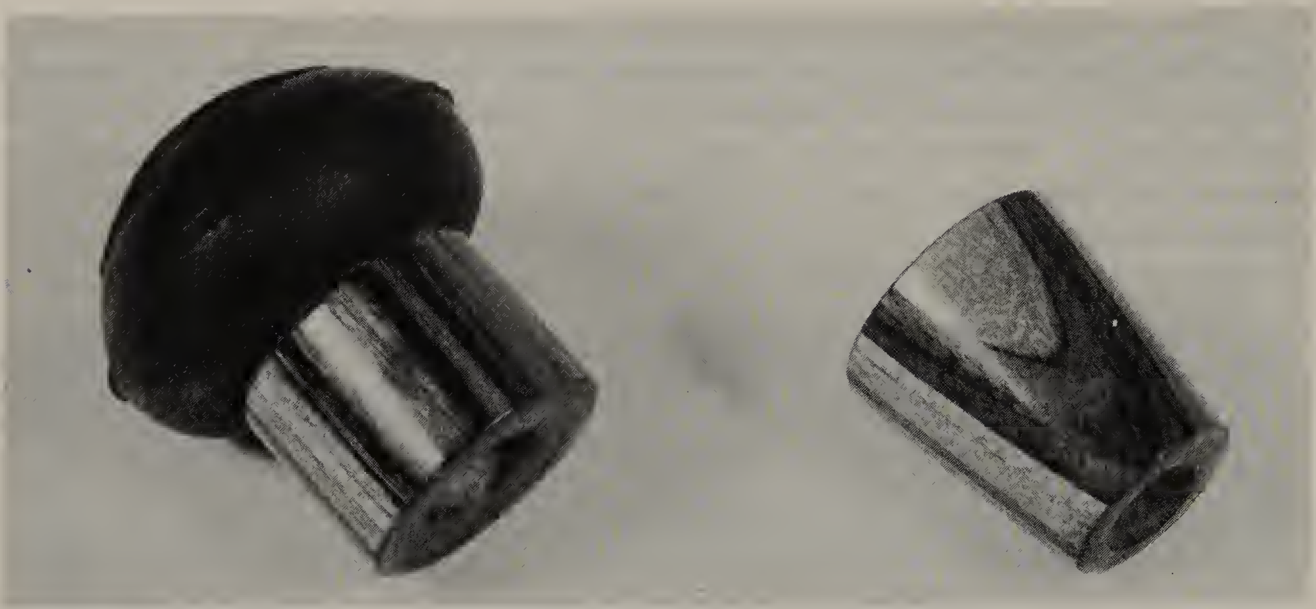
An easy-to-make and very functional butt cap can be made from resin-impregnated wood and a black rubber mushroom cap. These caps have been available from supply houses and tackle shops for years. At one time, they were used on the wood butts of saltwater boat rods.

Determine the length you want for the wood body. Add about half the thickness of your rubber mushroom cap. Turn the body to the desired diameter and shape to blend into your butt grip. Next, turn a recess or notch around the butt end, onto which the mushroom cap can be snapped. If the rubber portion is ever damaged or lost, a replacement can be snapped on.

Most rod-building supply houses carry anodized aluminum butt caps with removable rubber buttons. These are generally available in blank, brown, and gold in one-inch and 1⅓-inch lengths. They taper slightly and have an inside diameter in the range of .825 inch.

Since the rubber buttons are removable, they make excellent matching hosels as well as butt caps. On freshwater grips you can usually just force them over the ends of the grips and anchor them with epoxy. The grip compresses enough and the aluminum walls are comparatively thin, so the exterior lines of grip and aluminum blend very well.

On cork grips it is best to recess the cork by the thickness of the aluminum wall. Blend the taper of the grip into the taper of the aluminum. Allow space at the end of each



Matching butt cap and hosel of Customwood.

Gold-anodized butt caps are used as cap and hosel on black resilient grips and a Fuji reel seat with gold hoods.

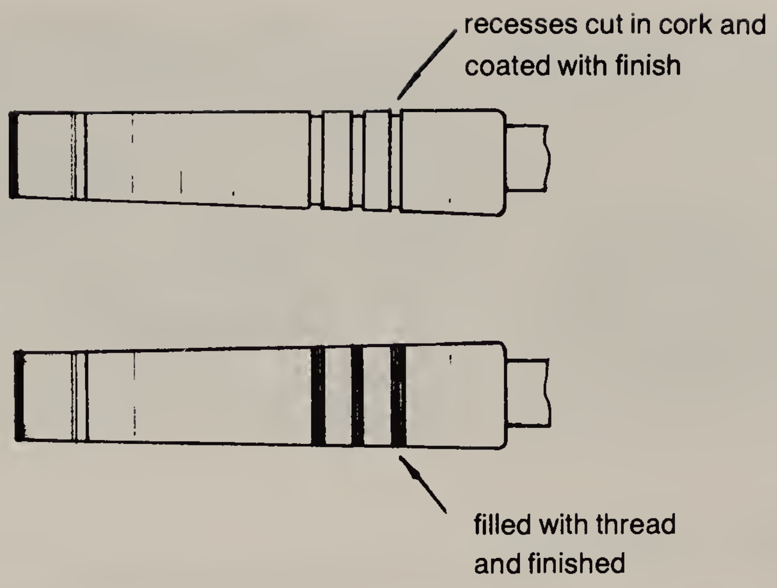
grip for the rubber button. On the forward hosel drill a hole in the center of the rubber button to fit the rod blank.

Using identical caps for the butt and the foregrip hosel gives a handle assembly a pleasant symmetry—very prefessional looking. Colors can be tied to the blank, to the wraps, or to other components. For example, the gold caps look great on a rod with black resilient grips and a black Fuji reel seat with gold hoods.

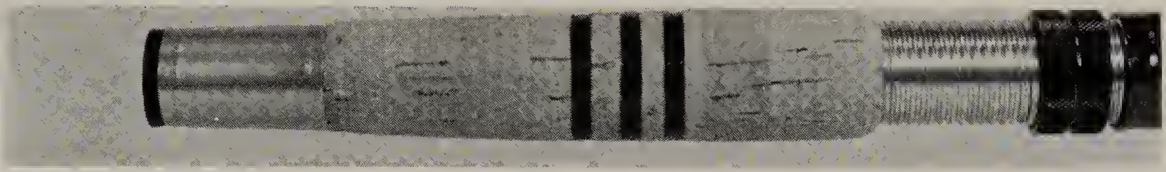
Colored-thread trim

A simple method of adding a touch of exactly the same color as the wrapping thread to the handle is to make a trim band of thread on the cork. Since this wrap plus the thickness of the finish on top of it must be flush with the surface of the surrounding cork, a recess must first be made in the cork. Cut the recess while the rod is revolved in a rod lathe, or while the preformed grip is revolved in an electric drill. While very narrow strips of sandpaper can be used, this is another ideal place for a homemade abrasive tool of cutting grit imbedded in epoxy. With it, straight square-cut edges are much more easily made. A flat stick can be shaped to the exact width desired, then coated with epoxy and grit. It is then braced on a tool rest and held against the cork to cut the recess to the desired depth. This cut should be deep enough to allow for a coating of wrapping finish, the thread, color preserver, and finally the wrapping finish.

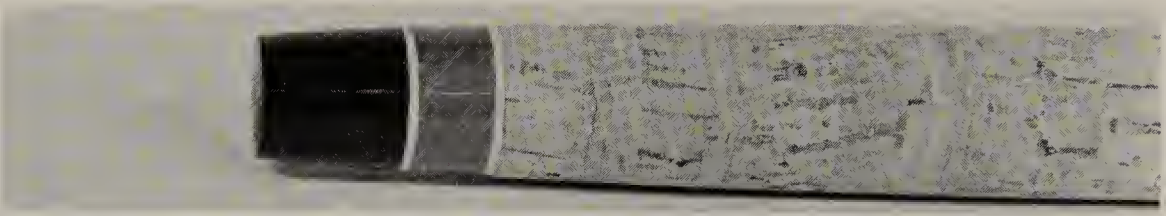
The reason a coat of wrapping finish is applied to the bare cork is to provide a hard, smooth base on which the thread will "slide" as it does on the blank. Otherwise, it may be difficult to eliminate slight gaps between the individual threads. If the recess is very narrow (for a narrow trim band), lay the tie-off loop in position before the wrap is started, and wind thread over it for the entire width of the wrap.


recesses cut in cork and coated with finish
filled with thread and finished

Making thread trim bands.



Thread trim rings.

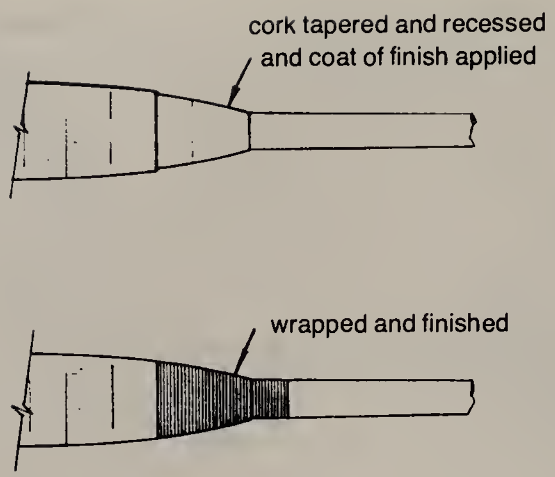


Trim band of thread next to butt cap.

A number of coats of wrapping finish will be applied to the thread both for protection and to bring the finished trim band up level with the adjacent cork surface. Care should be exercised here to keep the finish off the cork. In some cases, only the edge of the brush will be used to apply the finish. If, when completed, you find some of the finish did get on the cork, use the fine-grit side of an emery board or a bit of fine sandpaper to carefully remove it without scratching the finished thread.

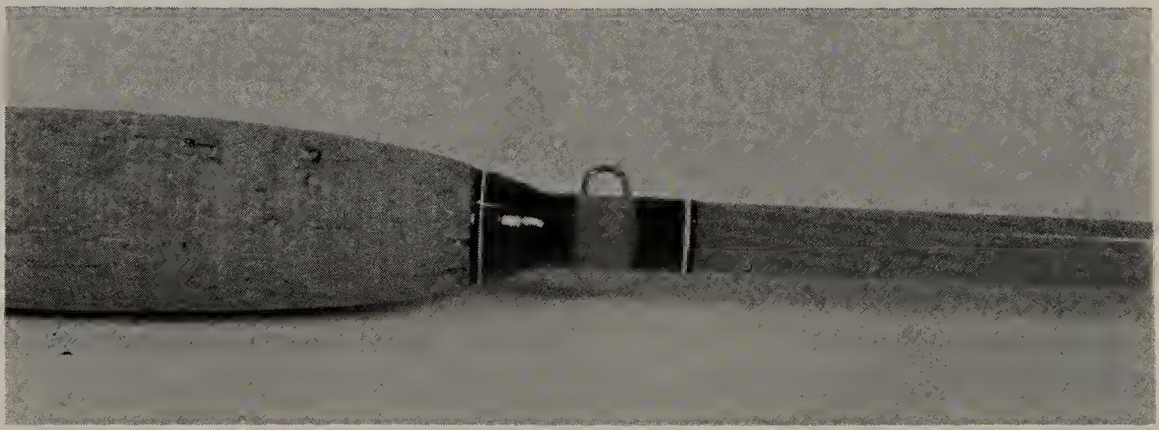
The thread hosel. Essentially the same technique is used to wrap thread from the blank, up over the end of a tapered foregrip. This is what I refer to as a "thread hosel." Here the foregrip is shaped in a taper that blends in with the diameter of the blank. Then a recess is cut over the desired length of the leading edge of the cork. The length of the recess is the length that will be covered by the thread. It is important that the front cork ring of the foregrip be tightly fitted and glued to the blank beforehand. Even so, when feathering the edge of the cork into the blank, a few bits of cork may crumble away. If so, don't be too concerned; just continue to blend the cork edge as best you can.

The spots where any cork crumbled away can be filled with wrapping finish when it is applied to form a base on the bare cork. If sizable pieces of cork broke away, or if there is a noticeable ridge of cork rather than a smooth taper to the blank, it is best to fill the space with a nonflowing epoxy such as PC-7. The advantage of PC-7 is that while it is sticky when applied, a tool or finger dipped in alcohol can be used to smooth the surface and blend the taper. When it dries, coat it and the bare cork with wrapping finish to form the hard base.



Steps in Making "Thread Hosel."

Start your wrap at the desired point on the blank and wind the thread up over the tapered cork. This will prove to be much easier than winding from the cork down onto the blank. Continue wrapping up to the square-shouldered edge of the recess where the wrap is terminated as close to the edge as possible. Use a thread-burnishing tool or your fingernail to spread the thread evenly, with no gaps, up to the shoulder in the cork. Finish as described for making a trim-ring wrap of thread.



"Thread hosel" made by wrapping over tapered cork.

Plexiglass and plastic

The use of 1/8-inch- and 1/16-inch-thick plexiglass trim rings with which to bracket a wood ring was mentioned earlier. These colored rings also make excellent trim when used alone or together in combinations. For example, the now familiar inlay of three rings separated by 1/4-inch cork rings is a good way to pick up the color of the wraps. Placing such an inlay at different positions on the grips can produce varied effects. Don't overlook placing it next to the butt cap.

Plastic rings can be combined just like resilient grip rings to make a single inlay. For example, black-red-black, all 1/8-inch rings. Or, use the thinner 1/16-inch black rings on the outside and the 1/8-inch ring in the center.

I have known a number of RodCrafters who use the colors of a customer's favorite football team or his old school colors around which to coordinate a rod. A bit of color in

Plexiglass trim rings.

the handle assembly echoes the wraps and is often very popular. It goes well with a simple wrap and trim-band combination of the guides.

You can purchase plexiglass trim rings from some supply houses ready to use as-is or to further shape. You can also cut your own trim rings from sheets of plastic, using a hole saw as explained in *Fiberglass Rod Making*. For sheet plastic and plexiglass, look in your Yellow Pages under "Plastic." Another possible source is a sign-making company. They often have scrap pieces left over from signs which they will be happy to sell or give to you.

Individual plastic rings or a number of them combined can be easily shaped in a lathe. You can place them on a threaded mandrel with washers and nuts, on a small drill arbor, or a plain steel mandrel. On the latter you wrap enough layers of masking tape for a tight force-fit of the plastic rings. Use a sharp, small lathe gouge or other cutting tool held against a tool rest. Make shallow cuts, removing a thin ribbon of plastic. Do your finish sanding with very fine sandpaper, then buff lightly to a high gloss.

Making handle components by casting

Many custom rod builders are content to use the stock parts found in rodbuilding-supply catalogs. Some make their own trim pieces by turning rings of Plexiglas or wood. And a few fabricate their own parts by casting them. The first craftsman with whom I communicated who used this technique was the late RodCrafter Clyde E. Pollard. He had built fishing rods for more years than most of us can remember, and finally arrived at the point where he wanted custom-made parts such as winding checks, butt caps, hosels, and trim rings. He naturally had his own ideas about the design of these parts and, after considerable experimentation, developed a method of casting them from polyester resin.

The first step in making a casting is to fabricate a suitable pattern from which a mold can be made. Any easily worked material such as hardwoods or soft metals can be used. Perhaps a material whose characteristics are more familiar to the rod builder—cork—will be easier for some to work with. Satisfactory patterns can be made of cork if you use a select quality, fill all the pits, and seal the surface with two or more coats of casting resin. If you can work comfortably with one of the other materials, less finishing of the pattern is required.

If, for example, you are making a pattern for a winding check, you would proceed as follows. Start with a piece larger than needed and drill a hole slightly smaller than the outside diameter of the blank where the check will later be fitted. Place the piece on a suitable mandrel and turn to the shape desired. Pay particular attention to obtaining a smooth finish. Remove from the mandrel and ream the inside hole to the exact final size. Carefully smooth the hole.

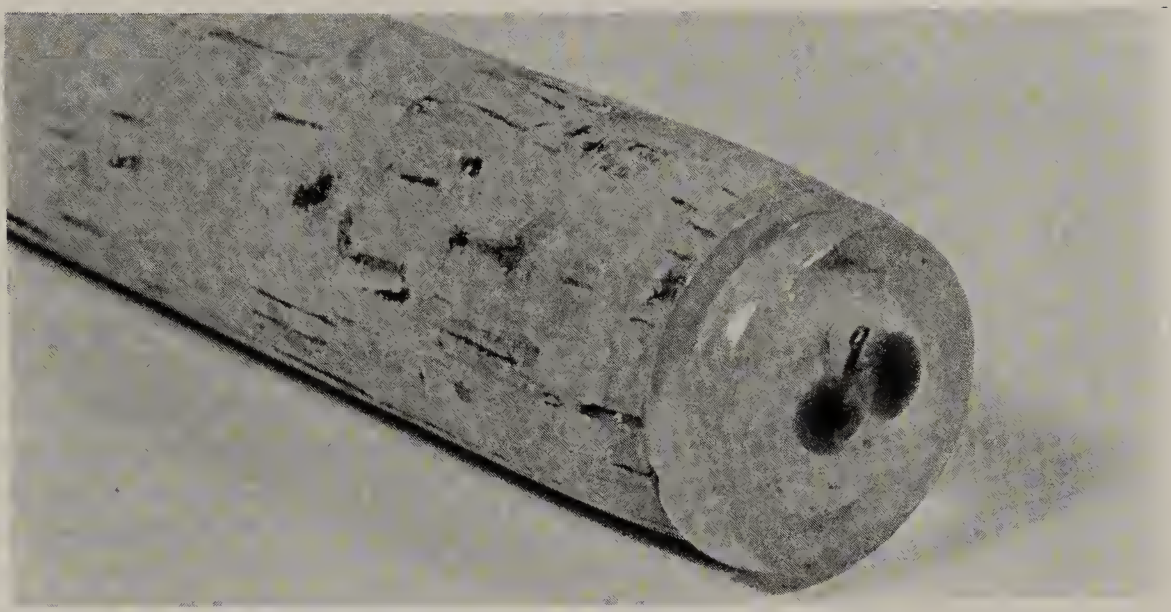
The next step is to make a mold. An ideal material is the liquid plastic for making soft plastic lures, such as worms. Select the smallest possible container, with adequate depth, in which to make the mold. Plastic lure boxes, hook boxes, etc. work very well. Heat the liquid plastic as per the instructions and pour a thin layer in the bottom of the container. Set aside to cool. Once the plastic has set up, place the pattern you have made in the center of the container. Heat more plastic and fill the container around the pattern to a level above the pattern. After cooling, remove the pattern from inside the two-piece mold. It will be easier to manipulate if you remove the entire mold from the container. Be particularly careful not to damage the soft plastic core that forms the hole in the winding check. You now have a mold in which you can cast many duplicates of your original pattern.

Estimate the amount of resin needed and add the coloring pigment. Lay two or three individual strands of fiberglass in the mold cavity, wrapping them around the core. These act as reinforcing material and strengthen the casting. Add the catalyst to the resin and immediately fill the cavity of the mold. The setup time is very short once the catalyst has been added. As a rule of thumb, one drop of catalyst is used with a teaspoonful of resin. The higher the temperature the quicker will be the setup, and the less catalyst will be required.

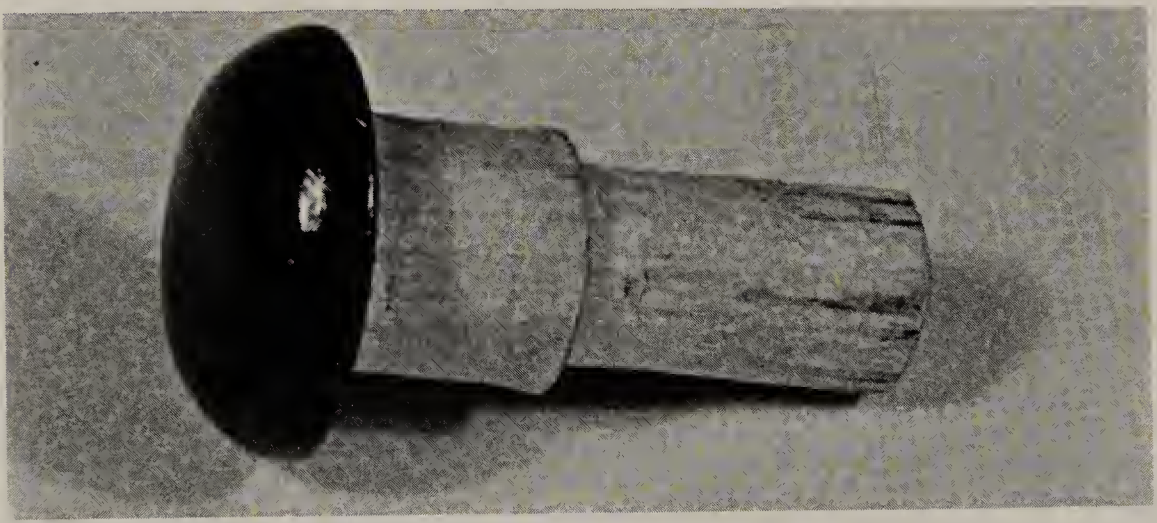
Cast winding check removed from mold.

How well you have made your pattern will determine how much final finishing, if any, has to be done to the cured casting. If you find some finishing is needed, slip the casting on an arbor and turn it in a lathe. Generally, only fine sanding is required. If the bottom or flat side is uneven, a few strokes on a sanding block should even it off for a snug fit on the rod. After installation a coat of clear resin will restore the color and provide a high gloss.

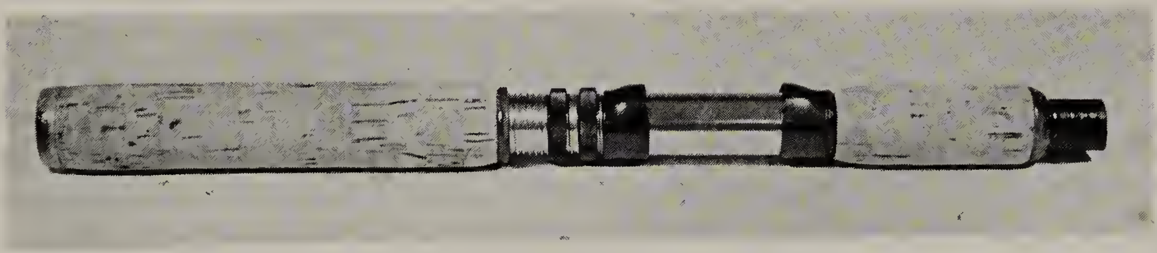
Clear polyester casting resin and catalyst are available in most hobby stores. They also carry the various-colored pigments. Clear parts with no pigment can be made and a small item imbedded in the casting. One of the photographs shows a butt cap containing a hook and two salmon eggs made in this manner. Another RodCrafter, Gerry Lipka, makes clear plastic butt plates for fly-reel seats that contain an actual fly.



Clear, cast butt cap containing salmon eggs and hook.



Cast butt cap on wood plug for mounting.



Handle with cast butt cap, cast rings on each end of reel seat, and cast winding check.

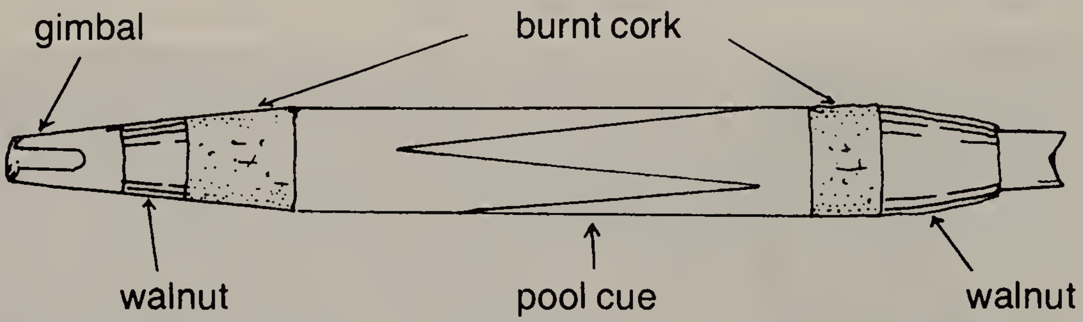
Casting unique components is thus still another way for the custom rod builder to add personal expression to his rods. As is true of many rod-building ideas, it is not for everyone. It will find its greatest application with the craftsman who builds many rods and does not want to fabricate the same part from scratch each time. With a mold of his own design, he can quickly and easily duplicate the component as needed. Color can be varied on each casting to coordinate with the colors of any rod, yet the part used is uniquely his.

Inlaid wood

In the constant search for interesting materials to use in handle trim, RodCrafter Paul R. Winston discovered a source of quality inlaid wood. The source? Broken pool cues!

They are usually made of well-seasoned maple and walnut, often with elaborate inlaying, or splicing, where the two different woods are joined together. Since they are round and tapered, they are easy for the rod builder to work with. Many times the taper will be in proportion to the handle being built. In other cases, they can easily be turned and sanded to the desired diameter.

First cut the piece to the desired length and as accurately as possible bore a hole through the exact center. The piece is then slipped on a length of threaded rod and locked in place with a washer and two nuts on each end. The rod is chucked into a lathe or electric drill and the piece trued around the center hole by turning. If the piece is to be used as a reel-seat insert (or spacer) with a skeleton reel seat, the outside taper is leveled to the required diameter. If it is to be used in the handle itself, the taper is adjusted as needed. The accompanying sketch shows a trolling-rod handle built on a "blank through design" complete with gimbal that Paul made from a piece of broken pool cue. It was augmented by some trim rings of walnut and burnt cork.



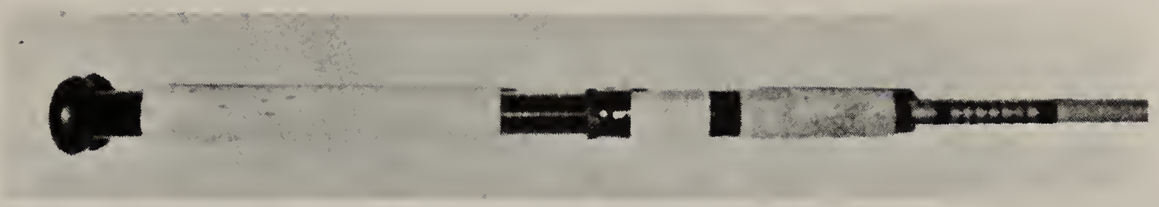
Pool cue used in "blank-through" trolling handle.

For a source of these handy bits of fancy wood, check local pool halls. Usually a friendly request to the owner to save any broken cues will be rewarded, since they are normally just thrown away. Home pool tables have become quite popular, so it might also pay to check with your pool-playing friends. Whatever your source, I think you will find that a broken pool cue can be an asset in fashioning a custom rod.

The above idea on pool cues appeared in the original edition of this book. I received a surprising amount of mail over the years from rod builders who not only found excellent uses for the inlaid portion of pool cues, but found other broken inlaid-wood items and put them to use. RodCrafter Ben Ritenour, who loves working with native woods, reported that his primary source was from demolished buildings and cast-off furniture. Encouraged by Ben, RodCrafter Ross Miller found an old toilet seat made of dark and light wood laminated together. It was the basis for a beautiful casting-rod handle. In the chapter on reel seats, under *Inlaid-wood reel seats*, a number of techniques are mentioned. These can be used just as creatively on other parts of the handle assembly.

Miscellaneous handle-trim techniques

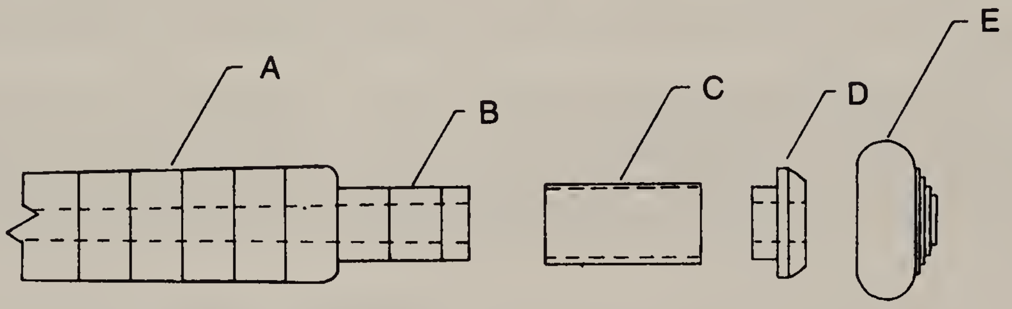
As noted earlier, making your own skeleton seats as explained in *Fiberglass Rod Making* is no longer the only way of obtaining these desirable components. However, RodCrafter Fred C. Rote has found that making your own provides a bonus in the form of the straight piece of unthreaded barrel that is removed from an anodized-aluminum reel seat. He uses this piece to fashion a matching butt hosel.



Matching butt cap made from removed section of reel seat.

After cutting out the center of the seat, file the ends to make them square and smooth. Set this piece aside temporarily. Refer to the accompanying diagram for the steps in making the matching butt hosel.

The first step is to cut a recess in the end of the butt grip (A). The diameter of the recess (B) should be sized so that the piece cut from the reel seat (C) will just fit over it. Make the length of the recessed section (B) ¼ inch *shorter* than the section cut from the seat (C). Check the parts for the proper fit, and epoxy the piece from the seat (C) over the recess (B) on the butt grip. Allow the epoxy to cure.



Custom butt cap using section removed from reel seat.

Take a single cork ring (½ inch long), slip it on a mandrel or arbor, and sand down one half of it so that it will just fit the inside diameter of the section removed from the reel seat (C). Shape the other end of the cork ring to a slight chamfer and of a diameter over which you can just fit a Model RB-1 rubber butt cap (E). The shape of the cork ring should be as shown in the diagram as Part D. The Model RB-1 butt cap is the type used on the end of boat-rod handles.

With the remaining parts fitted, all that has to be done is to glue the shaped cork ring (D) into the reel-seat section (C) and to the end of the recessed cork butt grip (B). Then, epoxy the rubber butt cap (E) over the top of the protruding end of the shaped cork ring (D). The large butt cap is quite functional; it makes a nice "belly bumper" and also protects the end of the handle from chipping. Incidentally, this idea is not limited to spinning rods, but can also be adapted to a fly rod on which a fixed fighting butt is being built.

Some other comments regarding butt caps are in order here. Sometimes a molded rubber or rubberlike butt cap will have small bits of material on the open end. This is known as flashing and is left from the molding process. The best way that I have found to trim this away without marring the cap is to place the cap, open end down, on a flat work surface. Do this in such a way that the thin flashing will be spread outward. Use an X-Acto knife or a Rod Builder's Knife to trim away the flashing by making the cut straight down, parallel and as close to the side of the cap as possible without cutting into the side of the cap itself.

CASTING-ROD HANDLES

There was a time when custom rod makers confined all of their functional and decorative work on casting rods to the guides and the blank. The builder merely selected one of a number of factory-made handles and chucked it onto the newly made rod. To be sure, this still happens much of the time today. Factory-made handles are better than ever, and if the handle fits the angler and his needs there may be no desire to customize it.

On the other hand, increasing numbers of fishermen prefer to have the grip on a casting handle fitted to them. Or they want to own something unique and they appreciate creative craftsmanship enough to be willing to pay for it. For these anglers there are more and more rod builders who have the interest and the talent to customize casting handles or, in some cases, build entire handles.

Many of us who build rods have been approached over the years by fishermen who want us to build them a longer casting-rod handle, or who want us to make them something that fits their hand better, or to fashion a handle with a large "belly-bumper" butt cap for comfort in fishing crankbaits. These and similar requests have attuned us to the fact that there are some functional needs not always met by stock handles.

We have also seen how attracted many casting-rod fishermen are to good-looking customized handles. Often these are the same anglers who have substantial investments in beautiful bass boats—a fact that speaks loudly of their interest in, and ability to pay for, fine fishing equipment. To some of them, the appearance of their rods means as much as the appearance of their boat.

Casting rods can be categorized as those having the handle grip offset at a slight angle from the blank and those on which the entire handle is straight in line with the blank. Detachable handles are almost always offset. Integral (blank-thru) handles can be straight or offset.

For many years, all offset handles had a chuck in the front that clamped down on the butt ferrule or adapter, making them detachable. To lower the costs of some factory rods, the glue-in handle was created. In a short time this style of handle became available to the custom rod builder. On the surface it appeared that the only difference was the deletion of the chuck. In many cases there were other cost-saving changes in construction or material to meet the competitive demands for lower costs. While it is a very broad generalization, it can be said that glue-in handles as a class are not as rugged and well-made as chuck-type handles.

Personally, I've always opted for the chuck type, not only because I believe it is the best in a company's line, but also because it has other advantages. It is a lot easier to make a rod with a detachable handle since I can remove the handle for wrapping and finishing. Yes, I can leave gluing the handle until last, but I'll need a chuck-type handle to do my test casting. If you have ever had to replace a guide or do other repairs on a rod with a glue-in handle you'll wish it were otherwise. Also, if for some reason the handle breaks or becomes damaged, you simply get another—if it's detachable. On a glue-in, you probably will have an awful lot of work. A detachable handle can be used on more than one rod. Another obvious advantage is in storing the rod or in traveling. With a detachable handle, the rod can go into a protective rod tube and the handle in a suitcase. If that doesn't seem important, remember that many, many more rods are broken in transit and storage than are ever broken while fishing.

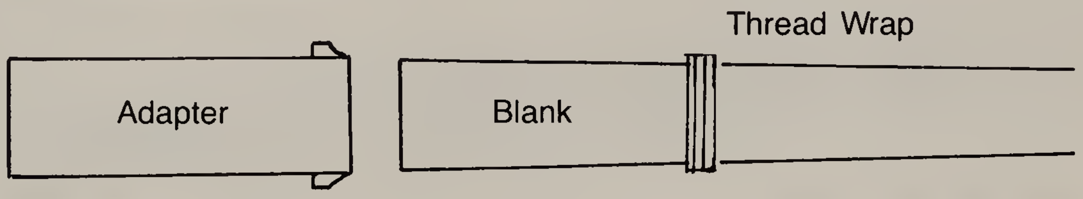
Mounting butt adapters

Both detachable and glue-in handles require an adapter be mounted on the butt of the blank. The purpose of the adapter is to enlarge the outside diameter of the blank butt so that it will fit into the handle. The inside diameter of the adapter is what varies with the size. An adapter is selected which is just big enough to fit over the blank. Never sand or scrape the blank in order to make it fit inside an adapter. This invites breakage. Instead, go to the next larger size of adapter.

The butt of a rod blank is tapered, while the inside of an adapter is straight with a constant diameter. Rod companies cannot afford the time to improve on this fit so they simply glue the two together or sand a bit off the blank walls at the very end. It is important to realize that this is where most casting rods break. As a custom builder, you can roughly double the strength of the junction at the adapter.

What you do, in effect, is to level the taper of the blank by incorporating a self-centering support. First slip the adapter all the way over the blank, then back it off just a hair's breadth. Lightly scribe a line on the blank at the end of the adapter. Remove the adapter and roughen the end of the blank to the line. Also roughen the inside of the adapter with sandpaper wrapped around a dowel.

Start a thread wrap at the scribed line and wrap toward the butt end. This should be a narrow wrap of about 1/8 inch to 1/4 inch. The variable is the size of thread. The band must be thick enough for the adapter to just fit over the top, and you may have to do some experimenting. If you used size "A" and the end of the adapter is loose enough to wobble, try size "D." If it's still loose, try two layers of thread, "D" over "A." If you cannot get the adapter on with size "A," drop down to "OO."



A self-centering support of thread is used to level the taper of the blank when it is glued inside the adapter.

When you find the combination with the best fit, epoxy the adapter to the blank. You can use slow-cure epoxy but I prefer non-flowing PC-7 for an even stronger bond. Make sure you use enough PC-7 to completely fill and level the taper of the blank. Excess PC-7 or epoxy should be carefully wiped off the outside of the adapter and the blank with a rag or paper towel moistened with alcohol.

Customizing a casting handle

Any handle used on a custom rod should be the best obtainable. That's true whether the handle is customized or not. Our primary investment is our time and our creative craftsmanship, and the few dollars saved on a cheaper handle is false economy. Fuji was the designer and originator of the modern fiber-plastic casting handle. It utilized a revolutionary adapter system that placed two inches of blank inside the handle for a much stronger mount than the metal butt ferrules which had been in use for years. The handle was stronger, yet lighter, more comfortable in the hand, and looked much better. Over the years, Fuji handles have improved in numerous ways. In the same period there has been a steady stream of inferior look-alikes made to sell for less. None of these cheap handles have held up very well in fishing. I'm overwhelmingly prejudiced in favor of Fuji, but I don't have stock in the company. It's an honest opinion built on experience.

Practically all of the customizing is done at the grip end of a casting handle. The frame is generally used intact. To remove the vinyl grip material, make four slits, one along each axis. Use a sharp knife and start each cut at the upper end of the grip. Stop the slit about one inch from the butt end. Grasp the grip with one hand and hold the middle of the handle (around the trigger) with the other hand. Twist. Using the flared end of the grip for leverage, you should be able to break the glue bond and pull the grip free. In stubborn cases, insert a screwdriver in the slits and pry the vinyl loose.

When the vinyl comes off, be careful that you do not lose the three plastic trim rings at the top of the grip. I'd suggest you either tape them in place with masking tape or set them aside until you are ready to mount your new grip.

Handle models vary somewhat, but with the vinyl removed you will probably find a tapered shaft 3$\frac{9}{16}$ inches long. The shaft tapers from about $\frac{3}{4}$ inch at the top to about $\frac{1}{2}$ inch. Along the shaft, there are three rails approximately $\frac{1}{8}$ inch wide and $\frac{1}{16}$ inch high.

As noted, the dimensions and even the design of the shaft may vary somewhat on different Fuji handles. In any case, the objective is to modify the shape of the shaft as necessary so that you can easily fit and glue a new grip onto the handle frame. Most new grips—except those of wood—will be built on tubular aluminum available at most good hardward stores. I suggest that you secure the tubing first before modifying the shaft to fit. Select a strong aluminum alloy with a $\frac{3}{4}$-inch (or slightly smaller) O.D. and sufficient wall thickness for adequate strength.

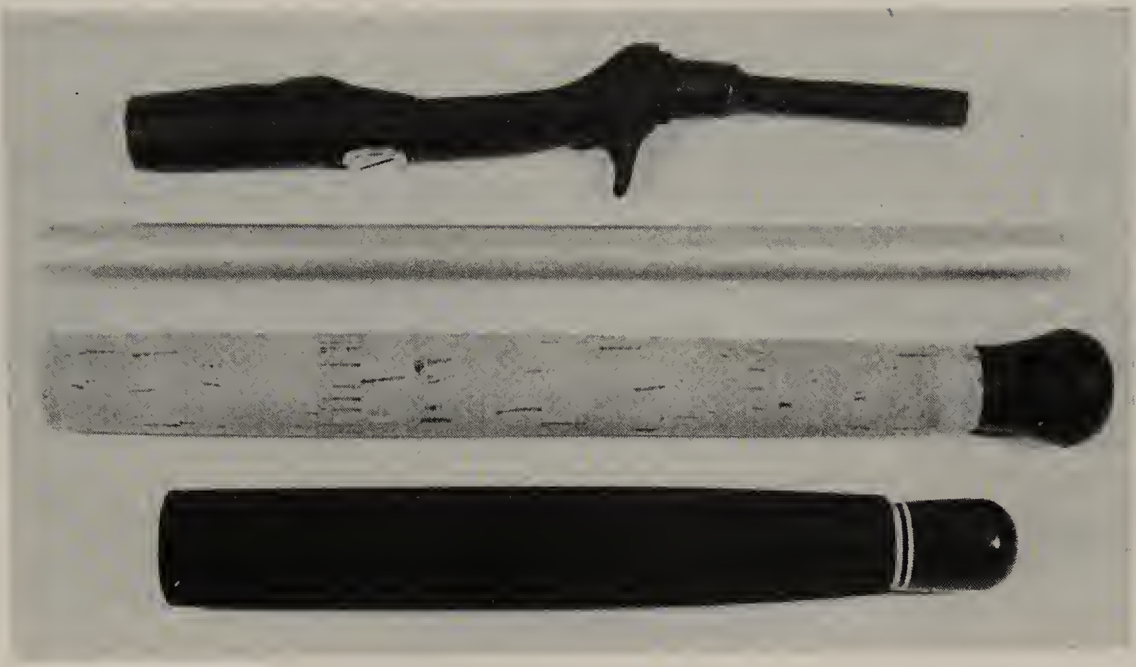
First, grind the rails from the handle shaft. A Dremel tool is very handy, but a bench grinder or a grinding stone on an arbor, mounted in a lathe or drill, will do the job. Check to see if your aluminum tubing will fit over the shaft and all the way to the trim rings. If not, grind off some material from the top of the shaft until the tubing fits.

Next, lightly grind the end of the shaft to remove any taper in the bottom $\frac{3}{4}$ inch. Wind masking tape around the end of the shaft to build a bushing that will just fit inside your aluminum tubing. This is the same technique used to center and shim a big-game rod's butt ferrule or a saltwater reel seat. When you have completed your new grip on the tubing, cement it in place on the handle with non-flowing PC-7. Use plenty of PC-7 so that the space between the handle shaft and the inside of the tubing is completely filled. Use alcohol for clean-up.

The first thing to consider on your custom handle is the length of the grip. Naturally, you want to fit it to the person who will fish the rod and to his needs. Many of the considerations discussed under *Fixed spinning reel seats* are applicable here. This is really just another butt grip, and its length determines the position of the reel seat on the overall rod.

RodCrafter Chuck Bethurum has extended the grip length using this same technique for quite a few Southern California fishermen. In most cases the grip was made long enough to comfortably fight fish. None of the handles failed despite some pretty sizable catches on these special, light rods.

One of the nice things about using aluminum tubing on which to build your grip is the ease with which it can be worked. Short or long, it's just a matter of cutting it to length. Actually, I initially cut the tubing a few inches longer. This gives me some waste stock on one end which I can place in my lathe chuck. The other end of the tube



Customizing a casting handle. (A.) Fuji frame with the shaft ground down. (B.) Aluminum tubing on which the grips below are built. (C.) Long cork grip. (D.) Resilient grip with plastic trim rings and Customgrip butt cap.

Custom-shaped cork grip on Fuji frame.

automatically centers itself on the lathe's conical ball-bearing live center. When all shaping and finishing is complete, the waste stock is cut off with a fine-tooth hack saw and the cut end dressed square and flush with a flat bastard file. The butt cap is glued on and the new grip mounted on the handle.

The tubing can be covered with any of the grip materials discussed previously. Cork is very easy to work with since all the rings are reamed to the same hole size. Resilient grip materials are also easy to mount with only slight modifications in technique. If the hole size is accurate in the material, let's say 3/4 inch, and the tube O.D. is the same size, it should be snug enough for an epoxy bond. If in doubt, spiral a layer or two of masking tape on the tubing first. If the hole size is smaller, even 5/8 inch, it can be mounted on the 3/4-inch tubing by following the procedure below.

The first thing to remember is that thick-walled, unshaped material cannot be stretched nearly as much as material with thinner walls. So, first place the unshaped grip on a mandrel and shape it to slightly oversize. Remove it from the mandrel. Use a dowel a little smaller than the hole to apply a coat of slow-cure epoxy to the *entire inside* of the grip. Hold the tubing vertical on your workbench and also coat it completely with the epoxy.

Hold the grip over the tubing and work the end of the tube into the hole. Steady the grip in a vertical position with your left hand. Use your right palm to completely seal off the hole at the top end of the grip. Push straight down with your right hand, keeping the hole sealed off and using your left hand to guide the grip onto the tubing. Don't squeeze the grip with your left hand. By keeping the hole at the top of the grip sealed, you will create an air cushion that helps expand and float the grip. As always, clean up with alcohol.

Naturally, any inlays or trim you might use with cork or resilient materials are just as applicable here as on any handle assembly. Leather-covered casting handle grips have already been discussed under *Leather Grips* in the preceding chapter. Custom pistol grips of resilient material will be covered later in this chapter.

Carved-wood pistol grip

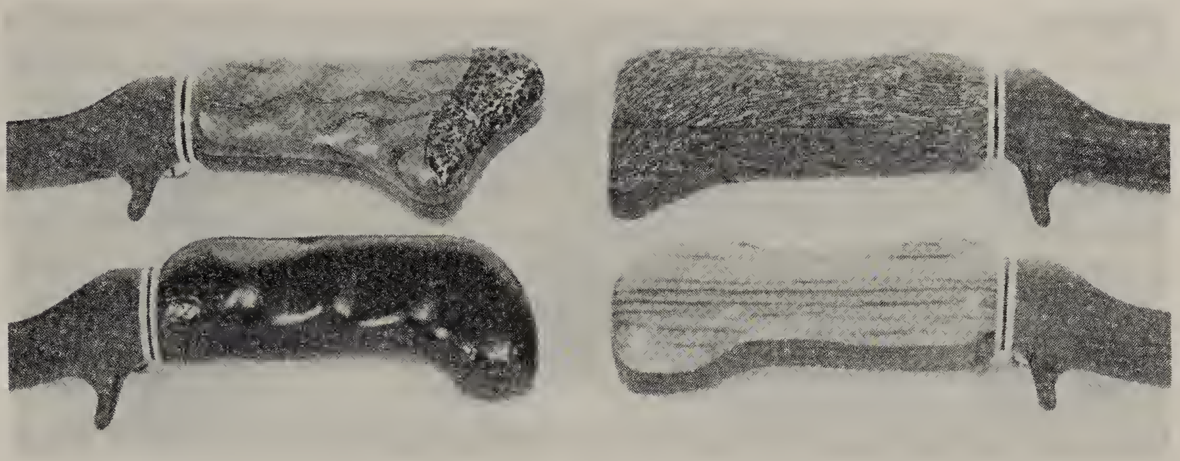
When making custom rods, many of us like to use wood, even in very small pieces, because of its natural beauty and the connotation of long-standing craftsmanship it carries. By making the entire grip of hardwood on a casting handle, we can improve the cosmetics tremendously and can also fit exactly the hand of the fisherman. This is more true of a casting-handle grip than that of any other type of rod. For example, the angler's right hand completely encircles the grip on the cast; then he shifts hands and his left hand palms the reel portion of the handle on the retrieve—with the heel of the left hand resting on a properly fitted recess in the top portion of the grip.

When the entire shape of a casting handle has been made for a particular fisherman, it just may be the most comfortable handle he has ever used. This can be done with a casting rod because after every cast the angler normally changes hands for the retrieve. This eliminates the hand cramping that occurs with fitted grips on rods such as fly rods. Any slight increase in weight due to wood is entirely in the hand and really not noticed.

There are two exceptions to the usual procedure of holding the rod with the right hand on the cast, then switching to the left for the retrieve. First, there's the left-handed angler, who typically holds the rod with his left hand at all times, using his right hand only to crank the handle of the reel. Interestingly, some anglers claim that revolving-spool reels of traditional design are poorly suited to right-handed people—the great majority of the population—since the position of the crank demands that the rod be held with the weaker left hand while fighting a fish. Several revolving-spool reels currently on the market can be bought in versions with the crank on the left side for just that reason. So the second exception, of course, is the right-handed fisherman who uses such a "left-handled" reel and has accustomed himself to holding the rod with his right hand at all times and palming the reel with that hand.

In the case of either exception—the southpaw angler or the fisherman who uses a "left-handled" reel—the custom rod maker again has an opportunity to shape the casting handle, including the palming recess, precisely for the comfort and efficiency of the person who will use the rod.

RodCrafter Dick Neal made some of the first carved wood pistol grips that I had seen and he was responsible for teaching many others through the *RodCrafters Journal.* Jack Justis picked up the ball and not only wrote about his methods but demonstrated them at a number of RodCrafter Seminars on the East Coast. Both men recommend grinding off the rails from a Fuji handle shaft, and sawing off about 1½ inches from the end of the shaft.



Carved-wood pistol grips on Fuji casting handles. The two on the left were detailed by bouncing a round ball cutter. The one at top right was given short horizontal strokes with a variety of cutters.

Any variety of hardwood can be used. Just make sure that the block of wood is square on the bottom so you can properly align it under a drill press. Sketch a slightly oversized outline of the desired grip shape on the side of the block. Use a bandsaw if available or another saw to rough-cut the block to the approximate shape of your sketch.

The next step is to drill the hole to fit the shaft on the handle frame. If your shaft is as described above you can drill a ¾-inch hole 1½ inches deep and then a ⅝-inch hole another ¾ inch in depth. If your shaft is different, adjust the size of your holes accordingly.

With the block held in place on the handle frame, mark an outline of the trim rings on the wood block. This outline is important when you shape the grip. You want to make certain you do not remove any wood inside this circle so the grip fits completely flush against the trim rings.

For the actual fitting and shaping, the person who will fish the rod should be present. Have him hold the rough-shaped block in the normal casting position and draw an outline around his hand and fingers. A Dremel tool with a small sanding drum works very well and because of its extremely high speed it removes wood very rapidly. You can also use a lathe, drill, or bench grinder equipped with an asortment of cutters, rotary rasps, or sanding drums. The job can be done entirely with hand tools, it's just slower.

Sand around the inside of the outline of the fisherman's hand. Take off small amounts of wood and re-check with the angler frequently to insure a proper fit. For the most part during this fitting process, concentrate only on the wood beneath his hand and fingers. Remove the other wood only where it seems to be genuinely in the way of a comfortable fit.

The next fitting step is for the recess in the top of the grip when he changes hands to retrieve. Have him hold the handle, with the reel mounted, in his left hand. Ask him if it feels comfortable as it is. If not, draw around the heel of the left hand and sand away some of the wood. I'd suggest you go lightly and slowly here. Many times it is not necessary to remove much or any wood. You are aiming for a comfortable fit of the bottom of his left hand as he cups the handle during the retrieve.

You do not need the fisherman present for the balance of the work on the handle. All you need to know is his preference for the general shape and any style of detailing *on the remainder of the grip*. Remove as much wood as needed to obtain the desired shape. Just make sure you do not remove any wood from beneath or immediately adjacent to the prior hand-fitting.

When you are satisfied with the finished shape, you may want only to sand everything smooth by progressing to fine, then very fine sandpaper. However, detailing can enhance the finished appearance, adding to the custom look. This detailing is similar to that done on briar smoking pipes. It can also be performed on other wood trim and components on other types of rods.

Small depressions or "dimples" can be placed anywhere *outside of where the hand will fit.* Place a round ball-shaped cutter bit in the Dremel tool (or drill) and lightly cut these depressions. With practice you can more or less bounce the bit fairly rapidly over the area chosen. Sometimes just a few small areas are detailed in this manner. In other cases, much larger areas look best.

Deeper recessions and shapes can be cut into the wood if preferred. There are a great variety of cutting bits available. Some handles look great when the entire surface has been distressed, with a number of different bits used with different strokes. RodCrafter Jack Justis has done some handles in this way and the finished grips looked more like stag horn than wood.

When you have completed the detailing chosen, finish sand the entire grip with very fine sandpaper to give it the smoothest possible surface. Blow and brush to remove dust, then wipe with a clean rag moistened with alcohol. Stain and finish as desired.

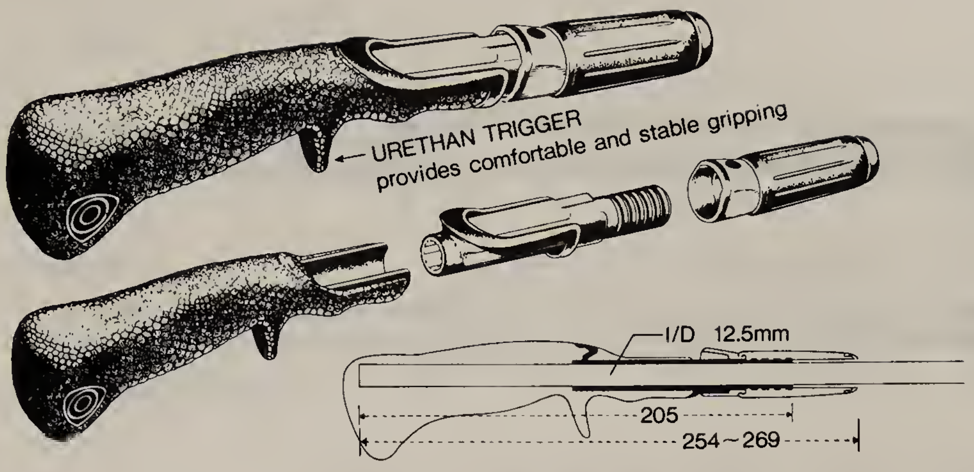
Hardwood grip, aluminum trim ring, and butt plate built on Fuji frame.

Despite all the hand-fitting that can be done on wood pistol grips, they are obviously not for everyone. Many fishermen prefer a straight, round grip. If, however, wood is a favorite material, make it from wood. First bore the center hole, then mount in a wood lathe to turn to the diameter and taper desired.

Blank-thru casting handles

Earlier it was mentioned that integral, or blank-thru, casting handles can be either straight or offset. For years, such handles were all straight. The idea of an offset handle with the blank passing through it came about as people searched for ways to increase sensitivity. A number of casting handles were designed in which the blank passed through the trigger reel seat, and then into the pistol grip at an angle. The angle at which the grip was mounted on the end of the blank was the offset angle.

If you analyze these handles, they are really like any spinning-rod handle assembly. There is first a very short foregrip which usually incorporates the sliding hood for the reel seat. Next, there is the threaded barrel and fixed hood of the trigger reel seat. (Some blank-thru handles incorporate both these parts, short foregrip and reel seat, into one component.) Finally, there is a pistol-shaped butt grip mounted at an offset angle. Either



Blank-thru casting handle by Fuji consists of three parts. Cross-sectional drawing shows the position of the blank inside the offset handle.

the seat is made in just a few internal sizes to fit a few blanks, or there are bushings. These bushings fit the I.D. of the components and are taper-reamed to fit the blank on which they are subsequently glued.

The basic design makes the handle assembly possibly a little stronger through the reel seat, but just as possibly a little weaker in holding the pistol grip. Depending on materials used, the handle assembly may be a tad lighter than a detachable handle. Keep in mind that adequate strength is not a problem on a top-quality Fuji detachable handle—it has been the cheap look-alikes that break.

Some of these handles have cut-outs in front of the trigger where the finger can touch the blank. Some have openings in the bottom of the reel seat so the reel feet are in contact with the blank. Still others have a soft trigger for more comfort.

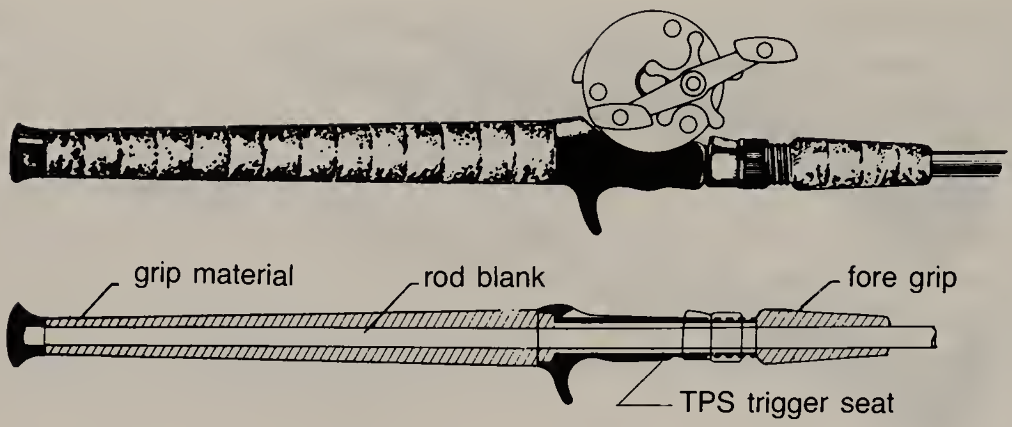
What about the sensitivity? Do these casting-rod handles really make a difference in what the angler can actually feel happening at the terminal end of his line? Experienced fishermen seem to be equally divided—some say yes and others say no. I feel that, like many other aspects of rod construction, it is solely a matter of personal choice. These blank-thru offset pistol-grip casting handles have been in use for a number of years now and there has been no overwhelming acceptance or rejection of them. As a custom rod maker I can build the rod whichever way I or my customer may prefer.

Let's look next at a very strong form of handle construction that has been with us for a great many years, straight, blank-thru handle assemblies. On this type the grip is not offset at an angle and the blank passes all the way through to the butt cap. All components are assembled around the blank as on a spinning rod.

This form of handle assembly is used on any rod *designed for casting* with a conventional revolving-spool reel. This would include all-purpose casting rods, bass rods, "pig-&-jig" rods, "kneel-'n-reel," flipping sticks, steelhead/salmon, and saltwater popping rods to name a few. As this type of rod (and reel) gets bigger, it grows into one of two categories: (1) casting no longer is important and the rod evolves into a boat or trolling rod, or (2) it becomes a conventional surf rod (without a trigger) which may be for general surf use, or in its slightly smaller form is a conventional pier or jetty rod.

Almost all of these blank-thru, straight-handle assemblies incorporate a trigger for the index finger. It may be part of a trigger reel seat or it may be a separate trigger.

One popular style of butt grip on this type of rod is called "Pistol Plus." This is a trademark of Lew Childre & Sons, Inc. Available only on their factory rods, this longer, extended grip is a combination of a pistol grip next to the trigger seat and a straight grip



Construction of a typical straight blank-thru handle assembly.

extending beyond. The length of the extension varies according to the purpose of the rod, with overall lengths for the butt grip from 6½ to 13 inches. The pistol-grip portion consists simply of a thickening or swelling on the bottom (trigger side) of the grip.

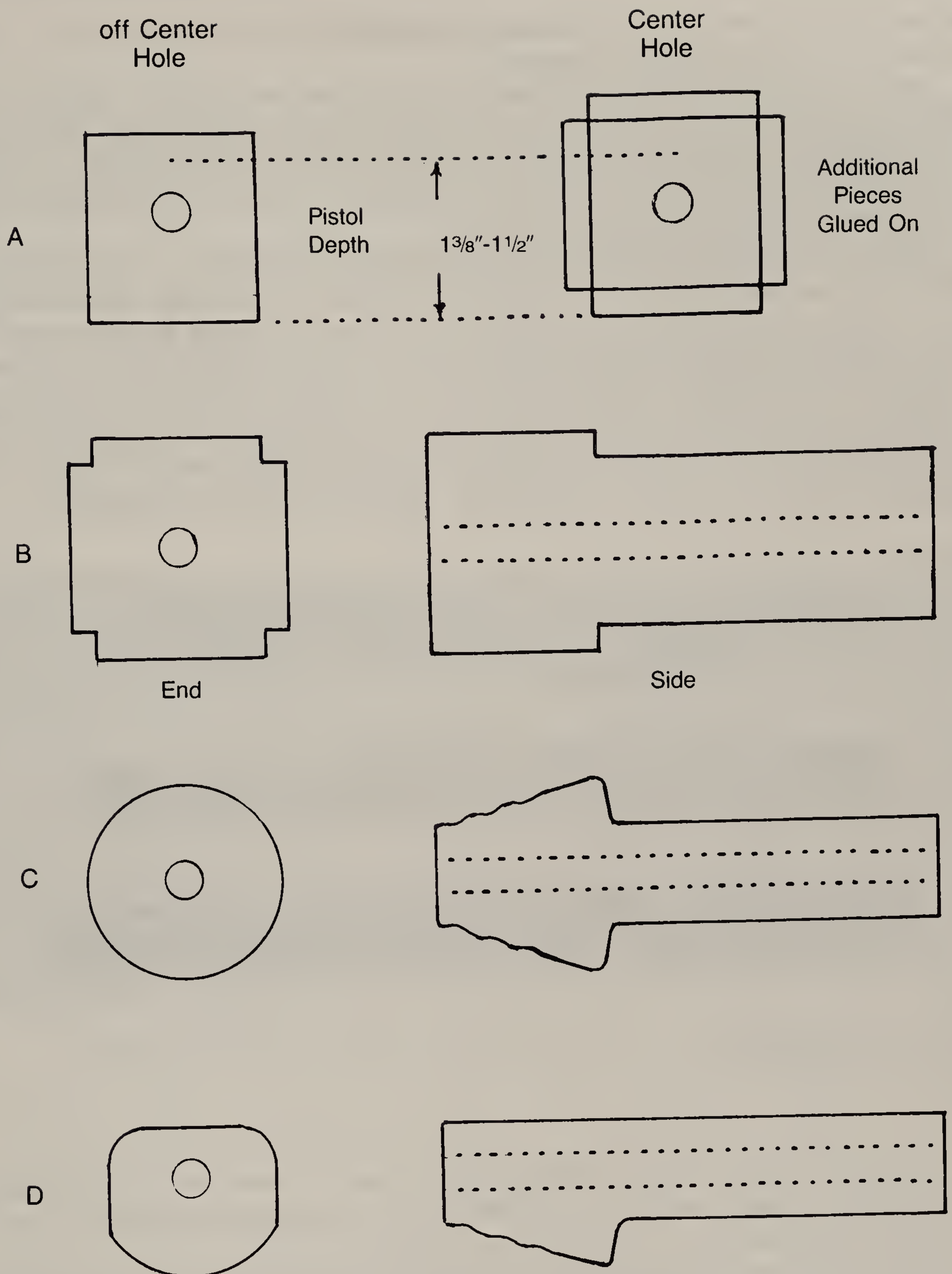
This is an ideal grip for the custom rod builder to make because he can custom fit the entire assembly to the individual fisherman. Such things as the length of the pistol portion and the overall grip as well as the diameter and shape of the pistol portion can be varied. The technique is one that RodCrafter Glen Haynes developed.

Combination pistol-straight butt grip of resilient material.

After all the dimensions are established, take a length of square, unshaped resilient grip material that has large outside dimensions—that is, thick walls. If the depth of your pistol portion is larger than can be made on your available unshaped grip, glue on additional flat pieces of material after squaring your length of grip. These additions need only be to the pistol-grip area. The drawings should help you evaluate the need for adding material or not. The extra material would be cut from another piece of unshaped grip. Follow the gluing technique explained under *Gluing resilient grips* in the chapter on glues and gluing. See also *Shaping resilient grips* and *Inlaying resilient grips* in the preceding chapter.

Slip your unshaped grip on a mandrel and chuck it in a lathe. The first step is to make a conical taper over the length of the pistol grip. The diameter at the forward end of the pistol grip should be *a bit larger* than the trigger end of the reel seat against which it will ultimately rest. This is to allow for additional shaping later (see drawings). The largest diameter will be at the butt end of the pistol grip. Immediately after that, make a fairly sharp taper down to the diameter of the extension. Complete the shaping for the extension.

At this time you should decide if you want the bottom of your finished pistol grip to be contoured for finger depressions. This is entirely a matter of preference. To add them, hold sandpaper against the revolving cone portion of the grip to cut shallow concave recesses. Another method is to use a section of round dowel on which cutting grit has



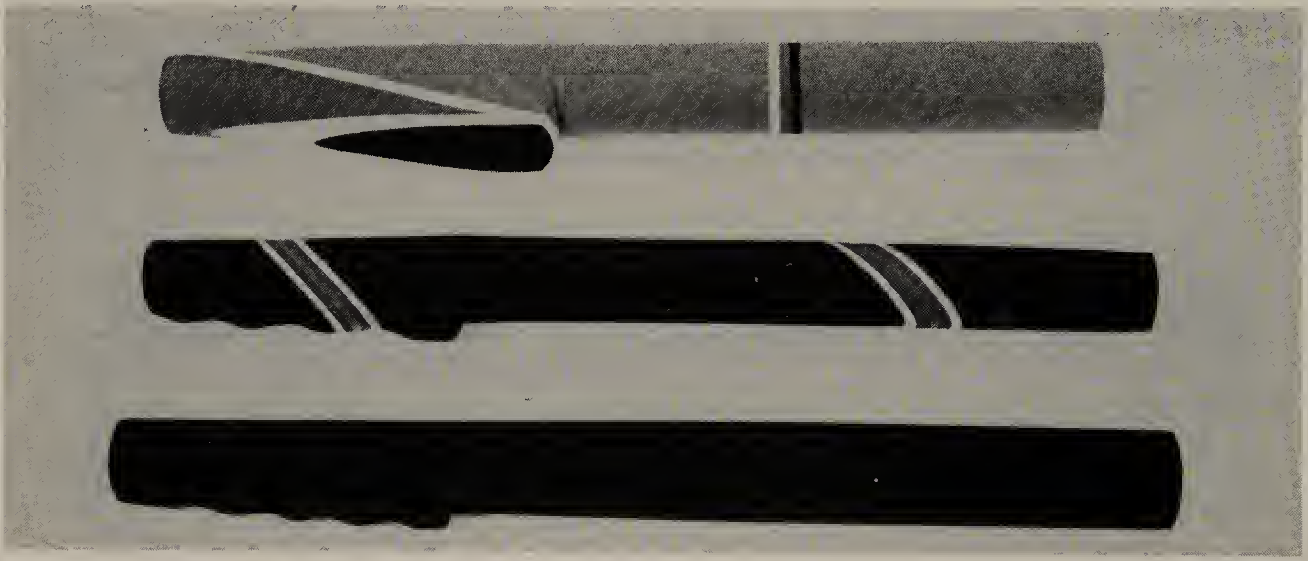
Steps in making a combination pistol-straight grip. (A.) If needed, glue on additional material to turning square. (B.) Pistol-grip area has been built up. (C.) The shape after turning on the lathe. (D.) A belt or disc sander is used for final shape.

been epoxied or to which the open coat sandpaper has been attached. Finish sanding can be done later.

Remove the mandrel from the lathe, leaving the grip on the mandrel. Use a disc sander or a belt sander that has a table at 90° to the sandpaper. Set the grip on the table so it is aligned with the axis of the mandrel. You want to feed the cone of the pistol area into the sandpaper so that it is flattened in line with the extension. *Do not remove too much* *material.* The flat top you are creating should not be below the top center of the extension. This will be the top of the grip.

Turn the grip 90° on the table and sand one side of the pistol grip flat. Align it as you did the top, blending the flat into the height of the extension. Turn the grip over so that you can repeat the flattening operation on the remaining side. Upon completion, the pistol grip will have a flat top and two flat sides. The bottom will be rounded and tapered, and if you shaped it, contoured for the fingers.

The next step, rounding off the two square corners along the top of the pistol grip, is best done by hand sanding. (If you are gifted with especially steady hands and an accurate eye you might want to remove just the edge of the corners by rotating the grip lightly past the power sander.) Use medium (80 grit) Swiss Super Sandpaper held in the hand. Move it very rapidly back and forth over the corners, i.e. along the axis of the grip, parallel with the mandrel. Do any finish sanding on any curves at this time. In order to give the entire grip the same texture, go all over the grip, moving the sandpaper parallel to the mandrel wherever possible. For a more velvet-like feel, progress to finer-grit sandpaper.



Combination pistol-straight grips. From bottom to top, the first three grips of this type ever made by Glen Haynes.

Remove the mandrel and your finished grip is ready to mount on the blank. When you so mount it, align the pistol grip as desired relative to the spine of the blank, probably 180° opposite the spine.

Making this grip is the kind of operation that is easier to do than explain. In the doing you will discover all kinds of things. I therefore strongly recommend you sacrifice two unshaped turning squares of grip material to the learning process. You'll be amazed at the improvement from one to the other.

Obviously, this technique can be used to make a custom pistol grip of resilient material for an offset casting handle. It can be built on a short length of aluminum tubing and the butt end of the tubing closed with a plug of grip material or a short butt cap.

Needless to say, inlays and laminations can be employed in the combination pistol grip and extension, or on an offset pistol grip. The grip can be given a rakish appearance by inlaying trim rings at a 45° angle instead of the usual 90°. Place the inlay so the top is closest to the reel-seat portion and the bottom closest to the butt.

SURF-ROD HANDLES

The term "surf rod" is quite general and broad. There are differences in the rods used from the beach along all our coasts. Further, some "surf rods" are specifically for use from jetties or piers. The lure-weight range of "surf rods" can be anywhere from ½ ounce up to as much as 16 ounces, and the length of the rods runs from about 7 ½ feet to as long as 14 feet. Since we are concerned in this discussion with handle assemblies, a better definition might be "two-handed saltwater rods for either spinning or conventional reels."

Since we are talking about rods on which both hands are used when casting, one of the most important aspects of design is the distance from the butt end to the reel seat. This translates into the distance between the fisherman's hands as he holds the rod during the cast. A fair amount has been written on this subject over the years, and much more has been passed by word of mouth among fishermen, and even from one generation to another. Prescriptions of specific lengths in inches, as well as all sorts of formulas, abound.

While some of these specifications may have made sense when applied to a specific rod and a specific fisherman, there are simply too many factors to be considered to accept fixed standards when building a custom two-handed rod. Those who say that a rod handle must be a prescribed number of inches long or that the reel seat must be a certain number of inches from the butt end are saying in essence that we all should wear the same size shirt.

A custom rod of the type under discussion should always be superior to a factory-made rod simply because the distance between the butt and the reel seat can be tailored to fit the fisherman. Just a partial list of the factors that determine that distance will include: the height of the angler, the length of his arms, the size of his hands, his strength, his style of casting, and, of course, the length and weight of the rod. This is the reason a custom rod builder is not ready to begin designing a two-handed rod until the person who will fish the rod is present.

As RodCrafter Clifford G. Webb explains it, "The custom builder needs to determine, among other things, the proper position of the reel seat and the length of the butt grip *for this particular customer.* On a rod of a given length and weight, two different fishermen may have vastly different preferences. One might like a wide spread between butt and reel seat, while another prefers to cast with his hands placed much closer together."

The best method I have found to determine this spacing is to first have the customer hold the bare blank (with tip-top attached) as if he were casting the rod. If it is a two-piece blank the sections are joined. I make a grease-pencil mark on the blank where his reel-seat hand feels most comfortable. This serves as a starting point for the next step. The customer's own reel is attached to a specially prepared test reel seat. This seat has a layer of plastic foam glued to the inside. This permits sliding it over various blanks and taping it and the reel to the blank. In lieu of this test seat, the reel can be taped directly to the blank.

I first tape the seat centered over the previously made grease-pencil mark and have the customer go through some casting motions. The seat is then retaped in both directions along the blank, and the "false casting" again performed. This is repeated until he finds the point which feels most comfortable to him. The distance is carefully measured and recorded.

If the customer does not feel certain about the best point, or if you would feel better with some more tests, by all means perform them. One test I learned from the manager of my tackle business, Dick French, is used by us in almost all cases. We slip a reel seat with a large enough inside diameter so as to move freely over the blank. The customer's reel is mounted in the seat and we have him go through as realistic a casting motion as possible. We tell him that the seat will move but that he should disregard it and concentrate on casting. At the end of the cast, we stop him before the seat is moved and note its position on the blank. We have him do this three or four times and average the results. We then move the seat to the average mark and tape it there. The customer is now asked to reel as if he were retrieving line. Amazingly, this position is most often quite comfortable for reeling as well as some more false casting.

If either the customer or the maker is still not sure, we tape the guides to the blank in rough, approximate positions and run line from the reel through the guides. The proper weight is attached and some actual casting is done. We emphasize to the customer that he should concentrate on what distance from butt to reel feels best—not on his casting or the performance of the unfinished rod.

The next discussion regarding the handle assembly is the reel seat. By far the majority of seats used today are the composite, graphite-filled resin seats. They provide a substantial weight saving over the older chromed brass types. The size, or diameter, must be big enough to fit over the blank. Next, it must be large enough to fit the customer's reel. Usually that leaves a fair number of sizes from which to select, and it is the customer who makes the selection based on which size feels best to him.

The rod builder and his customer also have a choice of the material used for the grips, their diameter, and their length, as well as overall handle design. We have already discussed the materials elsewhere: cork, cork tape, and resilient grips. A surf rod is sometimes carried in a vertical pipe holder on the front of a beach buggy where the grips will be subject to chafing. Or the fisherman may be operating from rock jetties and the rod will be wedged among the rocks between casts. This is pretty brutal treatment for any grip material and if the rod will be used under such conditions, a tough grip such as resilient material or cork tape will be required. The angler who uses only a sandspike or a leather rod holder worn around his waist can get by with cork, if that is his choice.

The rear grip can be one long piece from butt cap to reel seat. Or, a combination of butt cap and grip length sufficient to accommodate the fisherman's hand may be used on the butt. No grip is used between it and a point just below the reel seat, where a short length is attached to the blank. This is known as a split rear grip and is preferred by many anglers. Whichever style is chosen, the diameter of the grip and butt cap at the bottom of the rod should be sized to provide a comfortable feel to the fisherman. Some sample grips of various diameters are a definite help here. Thought should also be given to the selection of the proper butt cap. On a good-sized surf rod it must be tough and functional rather than just decorative. Polyolefin rubber is an excellent material. The walls should be thick and preferably molded with a knurled inside for solid gluing. I have found the best to be 2 inches long with smooth contours.

Depending upon the fish being sought, the dimensions of the foregrip can be quite important. If the angler's fishing requires the use of the foregrip in fighting a fish, it must be long enough (8 to 12 inches) and of the proper diameter to be functional. If, on a lighter rod, the foregrip will rarely be brought into play, then the decisions can be based largely on appearance. The material used will normally be the same as for the rear grip.

Admittedly, this process of fitting the handle assembly of a two-handed rod to the angler is a bit more time-consuming, but it pays handsome dividends in the form of satisfied customers and superior fishing instruments. In my opinion, the nearest to correct theory on how to design a surf-rod handle is that theory which provides the fisherman a finished product with which he is happy and comfortable—or with which he can most efficiently cast a baited hook or an artificial lure to the fish he is seeking.

Any of the previously discussed trim materials and construction methods can be used to add a custom flair to a surf rod. When selecting trim material, give some thought, again, to how the rod will be used. If it will be hand-held or supported in a leather rod support, trim can be placed anywhere on the grips.

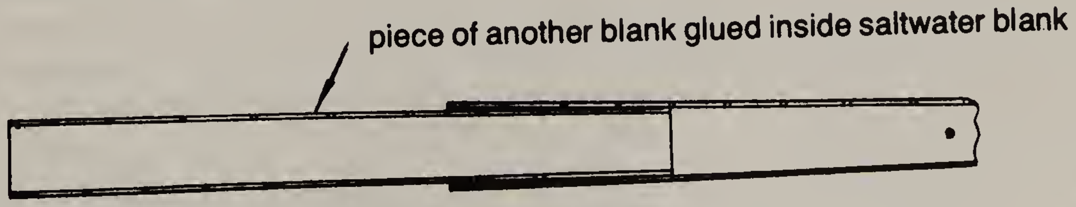
If the rod will frequently be placed in a sand spike, you have some options. If hard trim rings such as plastic, impregnated wood, or wood are used, they can purposely be placed at that point on the grip which will be in contact with the top edge of the spike. This will protect the cork from becoming dented and, in time, possibly chipped. However, the customer should realize that with long use, the surface of the trim ring will become chafed. This may be preferable to damaged cork, especially since trim rings can be refinished. On the other hand the customer may not want marred trim rings at some future time. In that case he has to make a decision between cork and the tougher resilient grips. The same options apply to a rod that will be carried in a pipe holder on a beach buggy.

Grips and handles on surf rods can be made of cork tape as mentioned earlier. Here, since the reel is taped or clamped wherever desired, less time is required in fitting the handle to the fisherman. An alternative to the old-fashioned hose clamp is the Fuji plate-type reel seat discussed in the chapter on reel seats. It holds the reel securely and is movable without chewing up the cork tape as a clamp does. It also looks many times better.

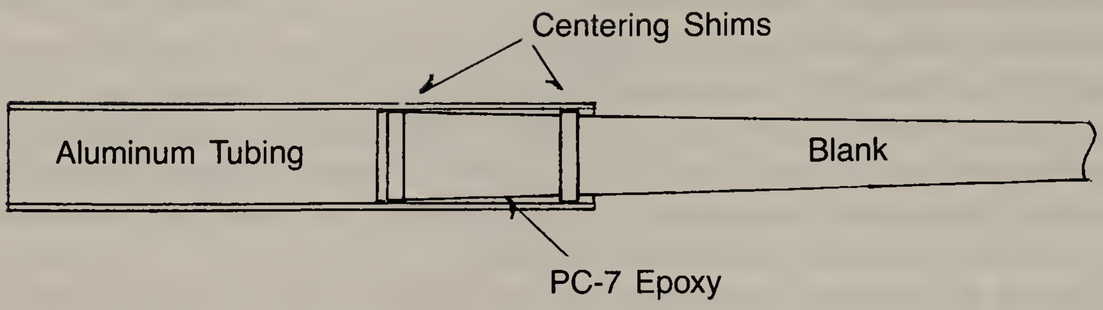
Extending the blank

On occasion the rod builder is faced with the problem of making a specific blank into a longer rod. This arises when all the characteristics of a certain blank are exactly what is required, except that it is too short—and a comparable blank is not available in a longer model. This rare situation is always frustrating, but can be dealt with by building an extension on the butt end of the blank. The long, two-handed handle is assembled over this extension.

One way to build an extension is to use a piece from another blank that can be fitted and epoxied inside the butt. The tapers will have to match over the length to be glued. This length, or the amount of the extension blank that fits inside the primary blank, should be at least 4 inches. If a piece of hollow blank is not available that will fit, a section of a solid fiberglass blank can be used. While it is a bit heavier, it has the advantage of shapeability. The end that will fit inside the butt of the primary blank can be shaped into a matching taper. This is best done by *scraping* with a sharp knife blade held at 90° to the axis. Care must be taken to keep the shaped section round, and material must be removed slowly. The technique for fitting the taper is exactly the same as that described in *Fiberglass Rod Making* for making a solid-glass plug ferrule. When fitted, the extension is epoxied into the butt.



Rod length extended by inserting length of matching-taper blank into butt.



Aluminum tubing used to extend the blank length.

The most used technique for building an extension is to add a length of high-tensile aluminum tubing. Many fishermen do not realize that this technique has been used for many years to extend factory rods for fresh- and saltwater. The English make their very best long-distance surf rods with a four-foot butt of tubular aluminum cemented to a 7½-foot graphite and fiberglass blank.

For our purposes, we need the aluminum tubing to fit snug over the butt of the blank. Again, at least four inches of overlap is required. To keep the blank centered while bonding it inside the aluminum, build a bushing of narrow masking tape on the blank. This should be located directly under the end of the aluminum. The leading edge of the butt of the blank should be rounded with sandpaper to eliminate a possible shear point. Also, the blank butt diameter can be shimmed slightly with masking tape if necessary. Use plenty of non-flowing PC-7 epoxy to completely fill the entire space between the blank and the tubing.

OFFSHORE TROLLING-ROD AND BOAT-ROD HANDLE ASSEMBLIES

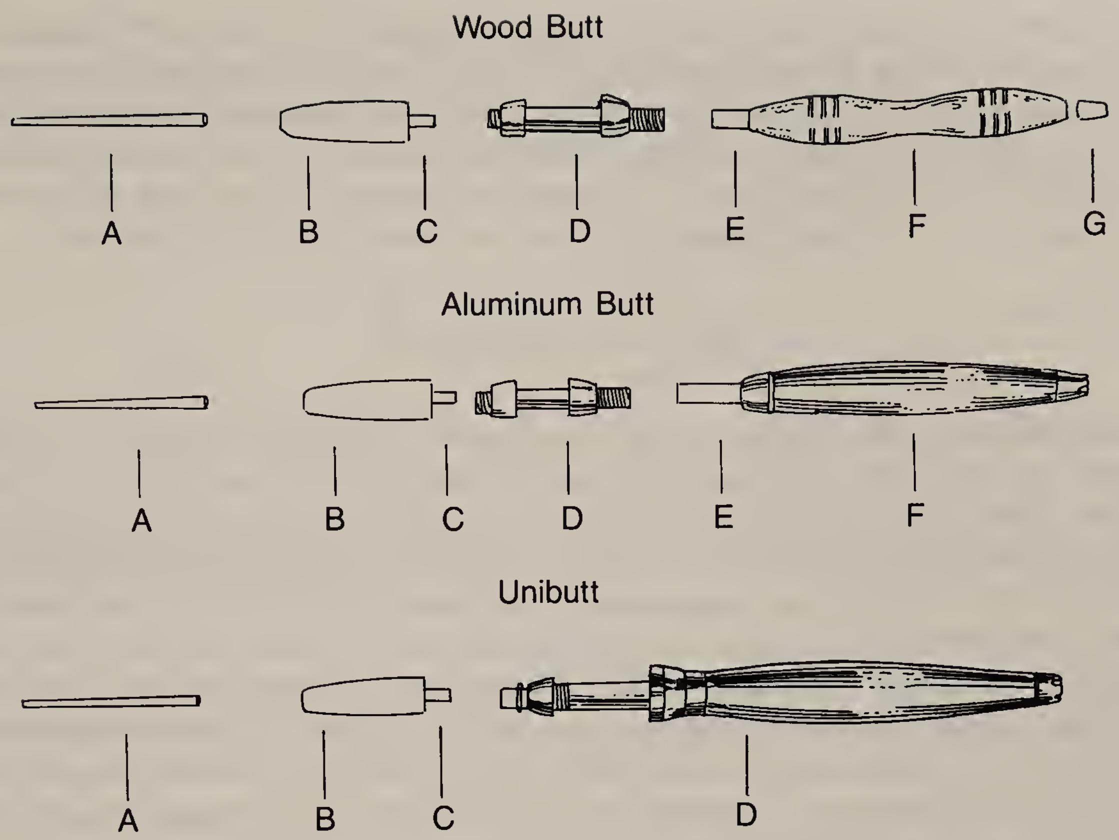
Offshore rods are made in two basic ways. In the first and more traditional method, the blank ends in a butt ferrule which fits into the reel seat. The handle assembly can be disassembled, if desired, from the blank. In the second method of construction, all the components in the handle assembly are permanently attached to the blank and the blank passes all the way through the handle section. You will recognize this as the blank-thru construction discussed in connection with casting handles.

Detachable offshore handle assemblies

Depending upon the components selected, assembly may vary slightly for detachable handle assemblies. To see how the various parts go together to make up the handle, refer to the diagram. We'll look first at a wood butt. On the butt of the blank (A) is fitted the male ferrule (C). Above the ferrule is placed the foregrip (B). The reel seat (D) is mounted over the tang (E) on the upper end of the butt (F). On the bottom end of the butt (F) is attached the gimbal nock (G). At one time, all offshore rods were made in this manner. Today, aluminum has largely replaced wood as the material for the butt.

When an aluminum butt is used, the gimbal nock is integral. As shown in the diagram, assembly is essentially the same except that the reel seat (D) is mounted over the tang in the aluminum butt.

The most popular method of assembly is with a Unibutt. This AFTCO component combines an aluminum butt with a machined-hood aluminum reel seat. The integral seat is



Detachable offshore handle assemblies. From top: wood butt, aluminum butt, and Unibutt.

factory-aligned with the integral gimbal nock. Assembly, as shown in the diagram, is simplified since only the ferrule (C) has to be installed on the blank (A), and the foregrip (B) mounted.

Offshore-trolling-rod handles must be the strongest of all rod-handle assemblies. Usually the rods are trolled from a rod holder. The impact of the strike must be absorbed by the handle, levered against the immobile holder. The handle, as well as the entire rod, is also subjected to tremendous strain in a prolonged fight with a heavy fish during which the extreme butt end is immobilized by the gimbal nock fitted into the fighting chair. Because of the punishment dealt them, specially designed, strong components are used. With a possible trophy fish at stake in the rod's future, it is well to heed the old adage that a chain is only as strong as its weakest link. Use only the best for *all* of the required handle components.

The reel seats used are of the locking type on which a collet nut on the top of the ferrule screws onto the top of the reel seat. For a complete discussion of these seats, refer to the chapter on reel seats. They are available with extra-strong stamped hoods or massive, heavy machined hoods. The choice is somewhat a matter of personal preference dictated by the size reel to be used, the fish caught, and the extra weight added by a heavier seat. Either type will be found on many classes of rods. Generally, however, IGFA rods of under-30-pound class are built with a stamped hood seat and those of over-30-pound class with a machined hood seat. You will find that on 30-pound-class rods the two types of seats are divided about equally.

The ferrule has a V-notch at the bottom which fits over a pin inside the body of the reel seat. This means that when the blank is mounted in the seat it cannot be twisted. When assembling these components the fixed hood on the reel seat must be perfectly aligned with the guides. Since the slotted ferrule is glued to the blank, it must be positioned to ensure this alignment.

The gimbal nock has two deep slots in the bottom. These are at 90° to each other, forming a cross. When the angler is fighting a fish, a slot in the gimbal nock fits over a pin in the gimbal ring of the fighting chair. In some cases, the angler fights the fish from a standing position and wears a harness or belt containing a gimbal ring. In either case, it is imperative that the gimbal nock be mounted on the butt so that when it fits over the pin, the entire rod is aligned properly with the reel exactly on top of the rod.

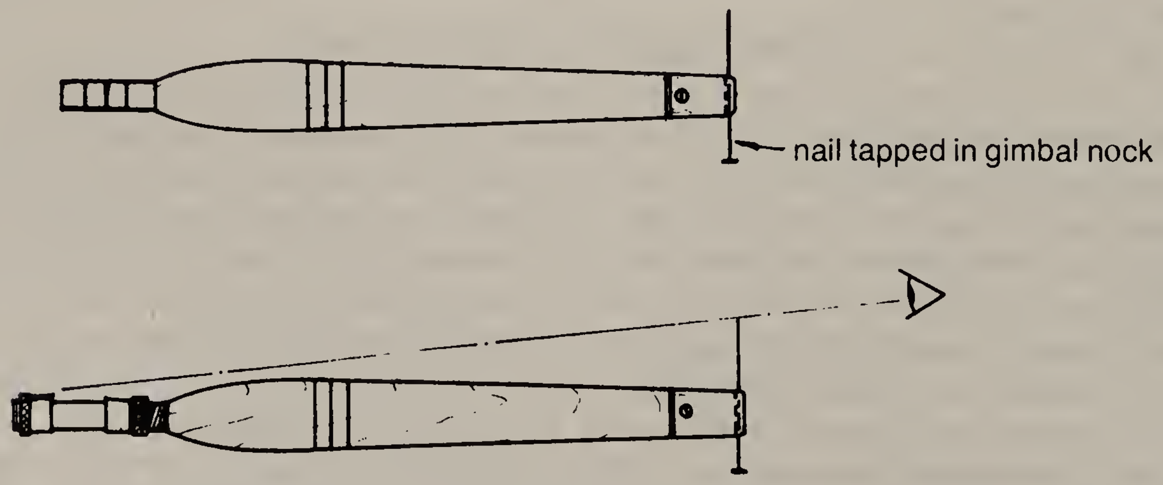
Alignment and assembly

It can be seen, then, that alignment of the various components forming the entire rod is critical. Because of its importance, let's review exactly what parts have to be aligned. First, the guides and tip-top should be placed on the effective spine of the blank. This will assure that the rod does not have a tendency to twist when fighting a fish. Since the V-notch in the ferrule determines the position of the guides relative to the fixed hood of the reel seat, the ferrule and the reel seat must be aligned. The heaviest-class rods may be built with a curved butt. This kind of butt will have to be aligned with the fixed hood of the reel seat so that the curve is centered away from the angler and the reel sits directly on top. Curved and straight aluminum butts have the gimbal nock mounted as an integral part. When the gimbal nock is separate, one of the crossed slots in the gimbal nock's base must be aligned with the fixed hood of the reel seat.

Any sequence of assembling the components that provides this alignment throughout the rod is fine. The method I now use is a composite of my own and that of our resident saltwater expert, Dick French, manager of my supply business. In describing it we'll assume we are using a separate aluminum butt.

When the reel seat was selected, the inside diameter of the seat had to match the outside diameter of the tang on the upper end of the aluminum butt. The seat is glued onto the tang using non-flowing, exceptionally strong PC-7. To align these components, a large nail or a length of broken rod tip is temporarily taped in one of the notches in the bottom of the gimbal nock. This serves as a sight, much like that on a rifle, to aid in perfect alignment with the fixed hood of the reel seat.

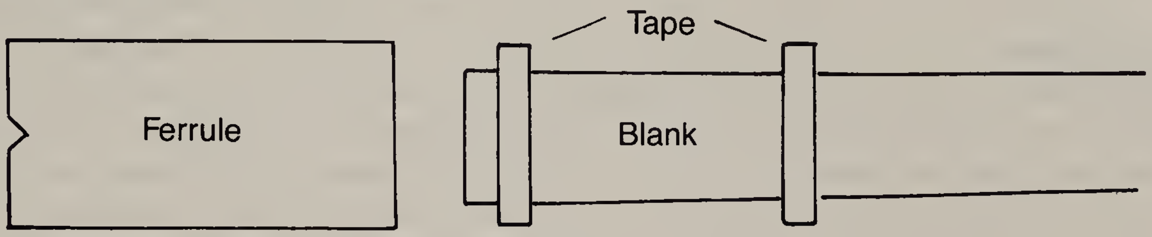
Place the aluminum butt horizontally in a vise padded with cloth. The vise need be tightened only enough to hold the butt horizontally with the nail in the gimbal nock



sighting along nail to align stationary hood on reel seat

Use a nail or piece of rod as a sight to align gimbal nock with fixed hood of reel seat.

pointing straight up. Without changing the position of the butt, rotate the reel seat on the tang until the fixed hood is dead center on the nail. You can view this best if you put your head at the reel seat end and sight along the assembly as you would a rifle barrel. When it is perfectly aligned, do not touch the assembly again until the PC-7 has cured.



Centering shims of narrow tape bands hold the blank in correct position inside the ferrule while PC-7 epoxy cures.

We next want to place a reference mark on the ferrule for future use. To do this, place the ferrule in the seat, align it on the internal pin, and lock it. Wrap a piece of ¼-inch masking tape firmly around the ferrule. Carefully sight on the center of the fixed hood and place a mark on the tape. This mark should be in alignment with the center of the fixed hood. We can now remove the ferrule from the reel seat.

If you have not previously located and marked the position of the effective spine on the blank, do so now. The ferrule can now be glued onto the end of the blank and the mark on the masking tape aligned with the spine mark on the blank.

To do this, we would follow the procedure explained under *Non-flowing epoxy* in the chapter on glues and gluing. On an offshore rod this is an exceptionally important glue joint where great pressures will be brought to bear. To level the taper of the blank inside the straight ferrule, use the strongest connection—a solid "bushing" of cured PC-7. To keep the parts centered while the PC-7 cures, make centering bushings of ¼-inch masking tape on the blank. Use plenty of PC-7 and completely fill the space between blank and ferrule walls. Carefully wipe the excess off, using a rag moistened with alcohol. Last of all, turn the ferrule until the mark on the masking tape is perfectly aligned with the spine mark on the blank. Do not move it until the epoxy has cured.

When the PC-7 is dry, slip the locking ferrule nut over the blank and onto the ferrule. *Don't forget to do this!* You can remove the masking tape with the seat hood alignment mark on it.

You now want to prepare for mounting the resilient foregrip on the blank. Wrap a neat bushing of masking tape directly on top of the ferrule's leading edge. This is a "stop" against which the grip will come to rest when you mount the grip. Also tape over the entire ferrule. Use enough tape so there are no gaps where glue could possibly get through when you mount the grip.

Mount the foregrip using plenty of slow-cure epoxy glue as a lubricant. A large bead of this glue will be pushed down over your previously taped ferrule. Use alcohol and paper towels to clean everything of epoxy glue, then peel off the protective tape from the ferrule. Allow the glue beneath the grip to cure.

The roller top is mounted with epoxy glue for the needed strength, and aligned with the effective spine of the blank. Occasionally the tip of the blank will be too large for the tube of the tip-top. You undoubtedly ordered a size tip-top to correspond with the blank manufacturer's specifications—and it is very frustrating to find the tip larger (thicker in diameter) than it was supposed to be. Many times the roller-top tube can be made to fit by sanding off just the finish on the blank. Since the walls are generally quite thick on a trolling blank, strength will not be affected if you sand off just the very smallest amount of fiberglass. However, you must be careful here. Sanding away much fiberglass will weaken the tip. Rather than risk that, exchange the roller top for the next largest size. Doing so will delay assembly of the rod, but it is the best course to follow.

Incidentally, this is a good example of where a quality dealer in rod-building supplies is so important to you. On your order to him you can request that he select the proper size roller top to *actually* fit the blank, regardless of the manufacturer's specifications. Since the price of roller tops increases with size, plan on having to use the next size larger and include that price with your order. Ask your dealer for a refund if the smaller size (the one specified by the manufacturer) does fit. It obviously takes the dealer more time to check this fit for you and select the proper size roller top. However, this is what "service" is all about, and may be the reason the service-conscious dealer has to charge a bit more. In the final analysis you benefited, since you didn't have the expense and annoyance of sending the wrong size top back to him. Nor did you have to delay assembly cf the rod. There are many similar problems encountered in building any rod, and in the long run it will pay you to buy from a dealer knowledgeable in custom rod building who places high value on service. I realize I have digressed from the assembly of a trolling rod, but I feel the point warrants it.

You may have to use a roller top that is larger than the tip of the blank, and one on which the fit is rather loose. A wrap of thread imbedded in epoxy will build up the tip for a good, strong fit. After the top is mounted, proceed to position and wrap the roller guides on the blank. Spacing and wrapping are covered in the chapters on guides and wraps.

Lighter boat rods are sometimes made with a friction ferrule and matching reel seat. The ferrule simply slips into the upper end of the reel seat. There is no V-notch in the bottom of the ferrule, no alignment pin inside the reel seat, and no locking collet nut on the ferrule. Alignment of the guides with the fixed hood of the reel seat is done "by eye" each time the rod is assembled by the fisherman. There are therefore no alignment steps in the assembly of the handle section of the rod. Do fit the ferrule to the blank first, and glue it in place. Then mount the foregrip. From that point you can work on either the guides or the handle assembly.

Blank-thru offshore handle assemblies

The construction of this type of handle assembly has, as the name implies, the rod blank passing all the way through to the gimbal nock or the butt cap. Many people feel it produces a stronger rod than one which disassembles at the ferrule. The finished blank-thru rod is also a lighter rod, an advantage if the fish is fought from a standing position rather than from a fighting chair.

Instead of using regular blanks of 62 inches to 68 inches, longer blanks of 76 to 84 inches are used. All of the components are mounted onto the blank. The butts are generally covered with resilient grip, allowing the reel seat to be placed at the perfect spot to fit the angler using the rod. The reel seats are slip-over models, either heavy-duty Fuji graphite-filled, AFTCO machined-hood aluminum, or chromed brass with stamped or machined hood. The seat must be big enough and rugged enough to hold the size reel that will be used with the rod. Foregrips are most often resilient, but can be made of any applicable grip material.

The butt end of the blank will be fitted with a gimbal nock if the rod is to be used principally for trolling and fighting fish from a fighting chair or with a stand-up harness or belt with a gimbal socket. Otherwise, the rod is best equipped with a comfortable butt cap to rest against the body when fighting a fish. To some people, this butt treatment differentiates between a "trolling rod" and a "boat rod." While such terminology may or may not be important, you should be aware that a great many different rods for both inshore and offshore fishing utilize blank-thru construction—everything from the lightest to the heaviest saltwater rods.

Once again, alignment of the components is important. To review, the tip-top and guides should be on the effective spine of the blank. These should be aligned with the center of the fixed hood on the reel seat and with the gimbal nock. Any assembly sequence that will help you with that alignment is fine. I'll review the one I use.

The effective spine is located and marked on the blank near the tip and also just above where the handle assembly will end. I put the gimbal on last so that I can place the blank's butt in my lathe and in the chuck of my low-r.p.m. dryer. I do have to locate the position of the gimbal in order to mount the butt grip. The gimbal nock is placed over the butt of the blank and a mark made on the blank at the top of the gimbal. The gimbal is removed and a second mark is made 1/8 inch below the first. Using this second line, a masking-tape bushing is carefully wound on the blank to serve as a "stop" when mounting the butt grip. After the butt grip is mounted, clean up with alcohol and remove the tape "stop" before the epoxy glue dries.

The reel seat can be mounted either up- or down-locking. What is seen most is up-locking with the fixed hood at the top. To align the seat later, I first make a mark on the top *edge* of the seat in line with the exact center of the fixed hood. I now encase the seat's threaded barrel, nut, and upper hood in masking tape to protect it from glue. The mark locating the center of the fixed hood is transferred from the edge onto the masking tape covering the side of the seat.

The seat is installed, and while the epoxy is still wet, the resilient foregrip is mounted. Alcohol and paper towels are used to clean off any residual epoxy. Rotate the reel seat so that the mark on the masking tape, denoting the center of the fixed hood, is aligned with the blank's effective spine. Next, carefully peel off the protective coat of masking tape from the reel seat *without moving the seat.* To aid me in this, I will often first remove the tape from the bottom and middle of the seat, before aligning the mark. I then put a short piece of tape across the junction of seat and butt grip. I hold the bottom of the seat while peeling away the tape from the top. When all the tape is removed from the seat—and it is still aligned—I take off the short piece of tape.

When the glue cures, the tip-top and guides are mounted. All wraps are color-sealed and finished, and last of all the gimbal nock is attached.

To keep the gimbal nock centered, narrow bushings or shims are made at each end of the blank. The space between gimbal wall and blank is filled with PC-7. A reel is mounted in the reel seat, making certain that the reel foot is centered in the fixed hood. The gimbal nock is installed, and any excess PC-7 is cleaned off with alcohol. A large nail or piece of broken rod blank is taped in the vertical notch on the bottom of the gimbal nock. Using this "pin" as a gunsight, the gimbal is rotated until the pin is in the exact center of the mounted reel. In sighting on the center of the reel you can also check alignment with the guides. At one time I used only the guides but found I could be more accurate using the reel. When aligned, do not touch again until the PC-7 cures.

A special blank is available for blank-thru handle construction where the builder does not want to install any kind of butt. It is called a Bottle Blank and made by Shakespeare. The name is derived from its wider, bottlelike tapered shape below the point where the reel seat is mounted. The butt of the rod is thus large-diameter fiberglass. No butt work is needed on this blank except for installation of a butt cap or gimbal nock. The slipover reel seat is mounted immediately above where the butt shape swells. Construction thereafter follows the same sequence as for any rod of the blank-thru design.

Another series of blanks, which could be put in a special category, are solid fiberglass. These are extremely rugged but are also very heavy. The blanks are made with the butt portion level, not tapered, so that a straight-bored wood butt can be easily epoxied over the blank. The wood butts have a tang at each end over which the slip-over reel seat and the gimbal (or butt cap) is epoxied. Most often preferred by party-boat captains for their durability and economy, the handle assemblies can be put together rapidly.

HIGH-LEVERAGE OFFSHORE RODS

In our discussion of the many different handle assemblies, we have worked our way through to offshore trolling rods. One type is designed to provide more favorable leverage to the angler. It is not the handle assembly that determines the leverage factor but rather the combination of blank length and handle arrangement. We therefore need to explore the whole rod.

In the chapter on blanks, under *Modifying the Blank*, we briefly discussed the principle of leverage: The longer the rod the more the leverage favors the fish; the shorter the rod, the more the advantage passes to the angler. The length of the lever is measured from the foregrip (the fulcrum), where the angler holds the rod, to the tip. Putting it another way, a fisherman with a short rod will apply more pressure on the fish than he will with a long rod—even though he applies the *same* pressure (upwards) at the grip on both rods.

We need to emphasize that these high-leverage rods are for stand-up fishing rather than for use in a fighting chair. While this style of fishing originated on the West Coast, it has spread to all coasts. It has become very popular with the many anglers venturing offshore in today's center-console boats. Without a fighting chair, the practical requirements of the rod change.

As Captain Joy Dunlap wrote in the *RodCrafters Journal*, "The basic leverage function of any rod is to keep pressure on game fish, yet allow the angler freedom to fight the fish with some degree of effectiveness. To get down to basics, the average angler is not a trained, top-condition athlete but is usually a weekend or occasional angler. By actual test, very few can apply and *sustain* 20 pounds of drag through the rod in a stand-up position even with a harness. One of the reasons for this is that the (traditional) rods are usually tip-heavy in balance and too long in tip length."

RodCrafter Al Clark compared two rods made from the *same model* 66-inch trolling blank. One was made in the conventional, detachable-handle manner with an aluminum butt. The other was made into a blank-thru rod with resilient grip covering the butt and a slip-over reel seat. Although made with a blank of the same length, the blank-thru rod was about 16 inches shorter. With the longer first rod, the angler could pull a maximum of 20 pounds of drag. Using the shorter rod made from the same blank, the angler was able to pull 38 pounds of drag.

It is fairly obvious, then, that shortening the rod between the foregrip (fulcrum) and the tip will increase the leverage. The leverage can also be increased by lengthening the space from the butt end (gimbal nock) to the foregrip (fulcrum). With this in mind, the IGFA (International Game Fishing Association) stated in their rules that "*the rod tip must be a minimum of 40 inches in length. The rod butt cannot exceed 27 inches in length.*

These measurements must be made from a point directly beneath the center of the reel. A curved butt is measured in a straight line."

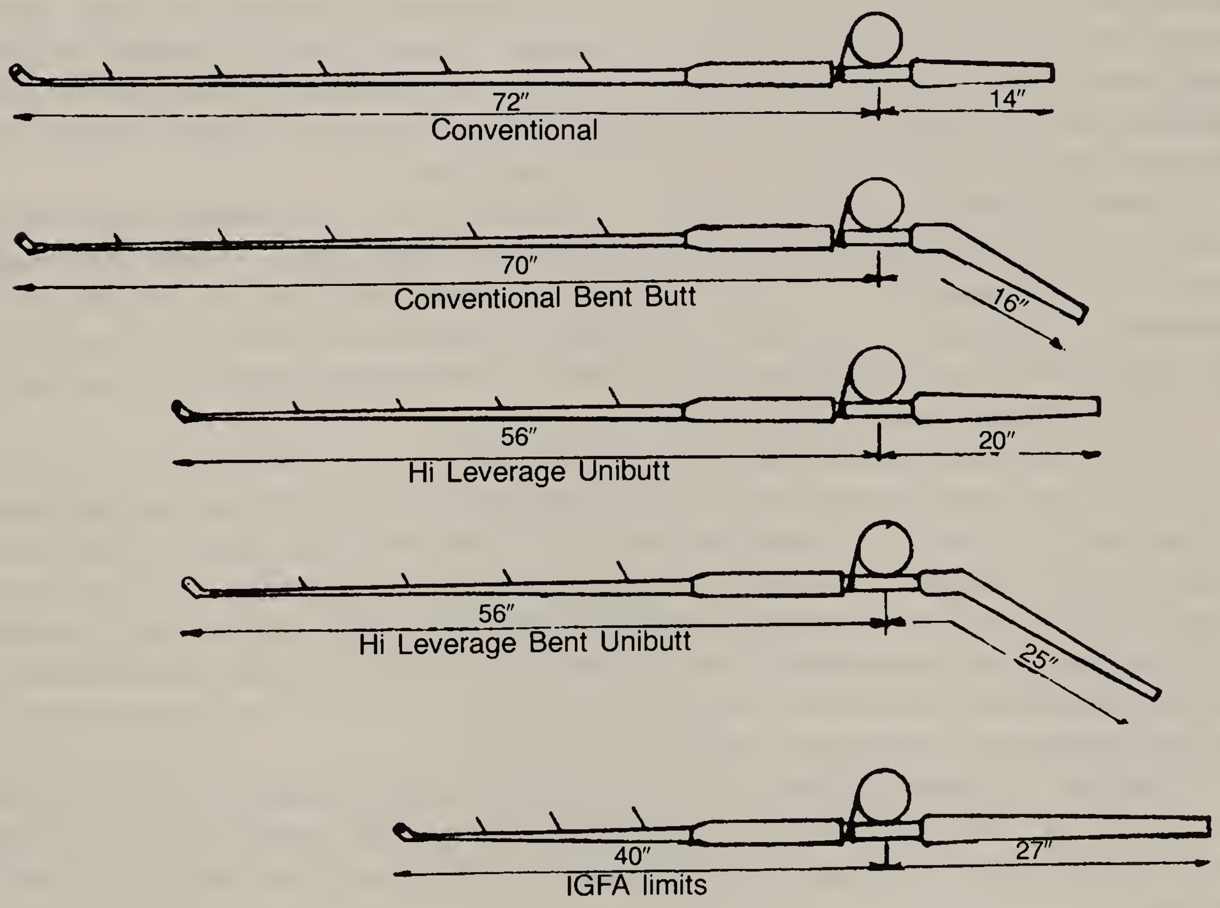
I might add that a rod built to these extreme limits would be exceptionally high in leverage and very impractical for fishing. I've never heard of anyone fishing such a rod, and the only one I've ever seen was made by RodCrafter Joy Dunlap strictly for illustration purposes.

Incidentally, it is not the rod that determines IGFA class requirements, but the pound test of the line. There are no requirements for the rod other than those listed above, and a preceding statement which says: "*Rods must comply with sporting ethics and customs. Considerable latitude is allowed in the choice of a rod, but rods giving the angler an unfair advantage will be disqualified.*"

So, if I put 80-pound test line on a rod a manufacturer has designated as a 30-pound class IGFA rod, I am fishing IGFA 80-pound class. The IGFA class label on a rod or a blank is nothing more than the manufacturer's opinion as to what pound test line matches it.

IGFA gives us little in the way of practical restrictions for offshore rods. As custom rod builders, we need to be aware of the results produced by different designs. One design specifically mentioned by IGFA in the rules is the use of a curved butt, which is to be measured in a straight line.

Curved butts are employed only on rods fished from a fighting chair. By their nature, they can be used only on rods made with detachable handle assemblies. Their purpose is to help reduce some of the strain on the angler by changing the leverage in his favor.



Five rods used to each pull 20 pounds of measured drag. The accompanying table lists the force applied to the angler on each rod.

Normally, curved or bent butts are used only on the heaviest-class rods, 130 pound or 80 pound.

It may be helpful to get some perspective on the use of the leverage factor and the use of curved butts by looking at data generated by Joy Dunlap. He compared the amount of force applied to the angler when 20 pounds of measured drag was pulled on five different rods. The drawings illustrate the dimensions and configurations of the rods. The rods were: (1) a conventional rod with straight butt, (2) conventional with bent butt, (3) high-leverage with straight butt, (4) high-leverage with bent butt, and (5) a rod built to the IGFA limits. The table below lists the force, in pounds, applied to the angler on each rod.

Rod	*Drag*	*Tip Length*	*Butt Length*	*Force on Angler*
(1) Conventional	20 (lbs.)	72″	14″	103 (lbs.)
(2) Conventional, bent butt	20 (lbs.)	70″	16″	87 (lbs.)
(3) High leverage	20 (lbs.)	56″	20″	56 (lbs.)
(4) High leverage, bent butt	20 (lbs.)	56″	25″	44 (lbs.)
(5) IGFA limits	20 (lbs.)	40″	27″	30 (lbs.)

We have been emphasizing the leverage factor so that you as a rod builder can use it creatively in the design of your offshore rods—*not* because we think all offshore rods should be of the high-leverage type. That would be like saying everyone should fish with a casting rod or a fly rod. Each has its purpose. Many offshore rods are made for fishing from fighting chairs. These rods need to be long enough to keep the line from touching the transom or gunwhale as the mate pivots the fighting chair, following the fish. Also, an angler fitted with a fighting harness and topnotch fighting chair is equipped to handle much more strain than the stand-up fisherman. He also wants to retrieve as much line as practical on each full pump of the rod, and this means a longer rod. These are some of the things to be considered when designing an offshore rod.

Most high-leverage, stand-up rods are of the blank-thru type. Because of the components used, they are lighter in weight than detachable-handle rods. Another advantage of this type of construction is that the rod can be completely fitted to the angler. The objective is to produce a sporting rod that gives the angler and the fish an equal chance. The bigger and stronger fisherman can handle a longer rod, while the smaller, less muscled fisherman needs a shorter rod.

Fitting takes the form of having the angler hold the blank *exactly as he would in fighting a fish*. The rod maker then pushes down quite heavily on the tip—proportionately to the pound test line to be used and the fish sought—and each person observes what happens. If the angler is physically pulled off balance, or if his heels lift involuntarily from the floor, or if he is just plain uncomfortable, the blank will have to be shortened from the butt, or a shorter blank used to start with. With the correct model blank, this testing continues and the blank is shortened, as needed, bit by bit from the butt until the leverage and power comfortably match the fisherman.

This kind of fitting is necessary since people's weight, strength, physical condition, arm length, etc, vary considerably. Changing the length of the blank by only a few inches can, and does, have a definite effect, especially as the pound class and size of the fish increase.

As in building most any kind of rod that will be braced against the body or placed in a fighting belt, the position of the reel on the rod must be comfortable for the angler. When fighting a powerful fish, the point at which it is most comfortable to turn the reel with the right hand will not always be a fixed number of inches below the point where the angler wants to hold the rod with his left hand. Since it varies with individuals, the length of the foregrip above the reel seat should also vary. Some rod builders solve this potential problem by (1) placing the reel seat at the point desired by the customer, then (2) using an exceptionally long foregrip (14 to 16 inches). In this way the angler has room to hold the rod a fair distance above the reel. He can also change the leverage on himself and the fish by relocating his hand on the long foregrip.

This is just another example of why a custom built rod is far superior to a factory rod.

SIX

Guides

PREPARATION OF GUIDE FEET

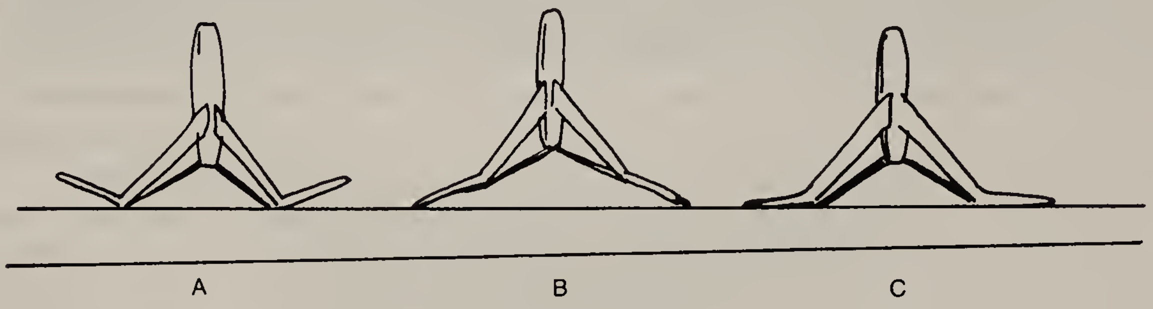
All guide feet should be checked before wrapping. Most will benefit from some dressing. Any rough spots on the underside of the guide feet may, in time, damage and weaken the blank, and finally result in a mysterious break. Consider for a moment the rather obvious fact that the blank bends on each and every cast. It also changes configuration slightly from round to oval, then back to round, each time it is flexed. The metal feet of the guide do not bend exactly the same as the rod. Therefore, there is a very tiny amount of movement between the guide and the blank. If the bottoms of the guide feet are not silky-smooth, abrasion will take place. A rough spot of metal will, from thousands and thousands of casts, dig into the blank. This movement between the two parts is also the reason guides should not be wrapped under heavy thread tension. Tension up near the breaking point of the thread will cause the guide to dig itself into the blank and, in time, cause the wall to collapse.

If you doubt that this movement between the two parts exists, or is significant, the following examination may convert you. Take a medium-light rod that has seen good service for a year or two. To make it easier to find what we're looking for, select one that has guides of average stiffness and preferably received a rather thick coat of finish over the wraps. Now examine the finish at the point just next to and beyond the edge of the guide feet. The chances are excellent that you will find small cracks and checks in the finish. They occur at that particular point, since that is where the end of the guide foot is moving the greatest distance on each cast. It is alternately being levered up and down, back and forth—and the finish is constantly being put under stress, causing it to crack and check as it breaks down.

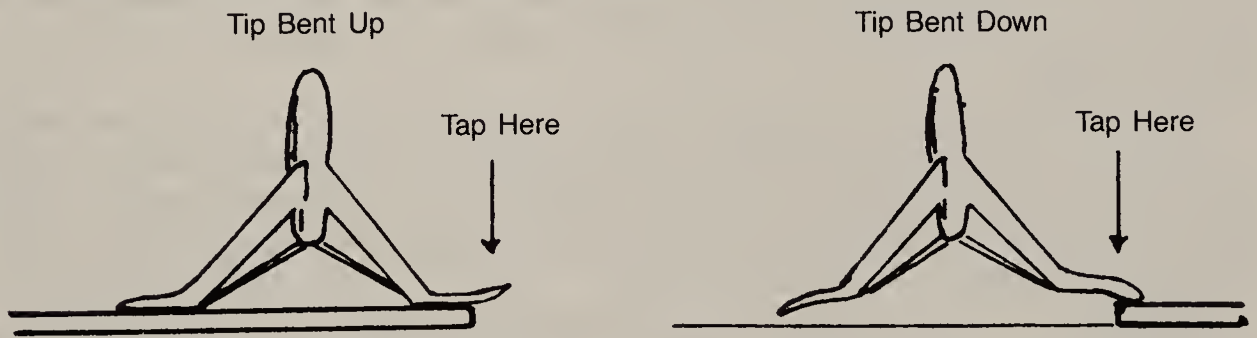
The top of the guide feet, especially where the ends have been ground, must also be as smooth as glass. The thread binding the feet to the blank is in direct contact with the metal. A rough spot or a sharp edge will, in time, cut the thread. For a handsome wrap, the top, leading edge of the guide foot should form a taper, and is therefore often filed or ground by the rod builder. Unless it is polished smooth afterward, you will eventually encounter trouble. If the taper is ground to a razor edge, as we are encouraged to do by some, it will cut the thread and cut into the finish from the tiny, but constant, movement.

These are the reasons why all guide feet should be checked, and must be dressed to a silky smoothness. Let me trace the steps in the preparation of guides.

The first thing is to make sure the guide feet are both flat and in line. When they are, they will distribute the stress equally along the blank, look much better on the rod, and be much easier to wrap in position. Set the guide on a smooth, hard, flat surface so that you can view it from the side. Both feet should sit flat along the surface. If they point upward at the tip, the guide will be difficult to wrap. After one foot is wrapped flat on the blank it will spring the other foot in the air off of the blank. This is the reason many rod builders have to tape both feet. If the ends of the guide feet touch the surface, but the portions nearest to the guide ring are not touching the surface, the ends will have a tendency to dig into the blank. It's easy to bend the guide feet, if needed, so they sit flat. Use a long-nose or needle-nose pliers with smooth jaws that will not mar the metal.



Prepare guide feet by bending so they sit flat on blank.



Using a steel rule as an anvil, an errant guide foot can be tapped into alignment.

Sometimes you will discover that the very tip of the guide foot is bent up or down. RodCrafter Roger Szczep finds the easiest way to correct the problem is with what he calls "some simple body work." He suggests using a steel rule for a straight edge, laid flat with the guide sitting on top. With a light source behind, you can see exactly how the guide feet line up and where the pressure is to be applied. If you have it, a small, light hammer is ideal, but almost any tool can be used for the light taps involved to straighten the tip of the foot.The steel rule becomes your anvil. The errant tip can be tapped into alignment as shown in the drawings.

When the guides sit flat, place them one at a time on a flat Eze-Lap Diamond Hone & Stone (more about these tools in a minute) or a flat file. The guide is moved back and forth several times. This automatically removes any tiny rough spots that might exist on the bottoms of the guide feet.

The next step is to taper the leading edge of each guide foot. We want a nice taper over which the wrapping thread can easily climb as the guide is wrapped onto the blank. I find that those new to rod building are many times reluctant to extend the taper back onto the foot far enough. They make the taper very steep, removing very little metal. Don't be afraid to create a shallow-angled taper. Not only does it look better when wrapped, but there is some evidence that suggests guides dressed in this way produce less cracking and checking of the finish at the ends of the guide feet (especially if heavy coats of high-build finish are avoided).

If you are working by hand, the previously mentioned Eze-Lap diamond tool is excellent. This tool is paddle-shaped, like a small flat file, and can be used everywhere you would use a file. The cutting surface is made of particles of industrial diamonds which never wear out and never rust. To clean them, just rinse in running water.They come in three grades, coarse, medium, and fine, and are superb for sharpening hooks and knives. I keep a set on my boat in the Keys and in my freshwater tackle box.

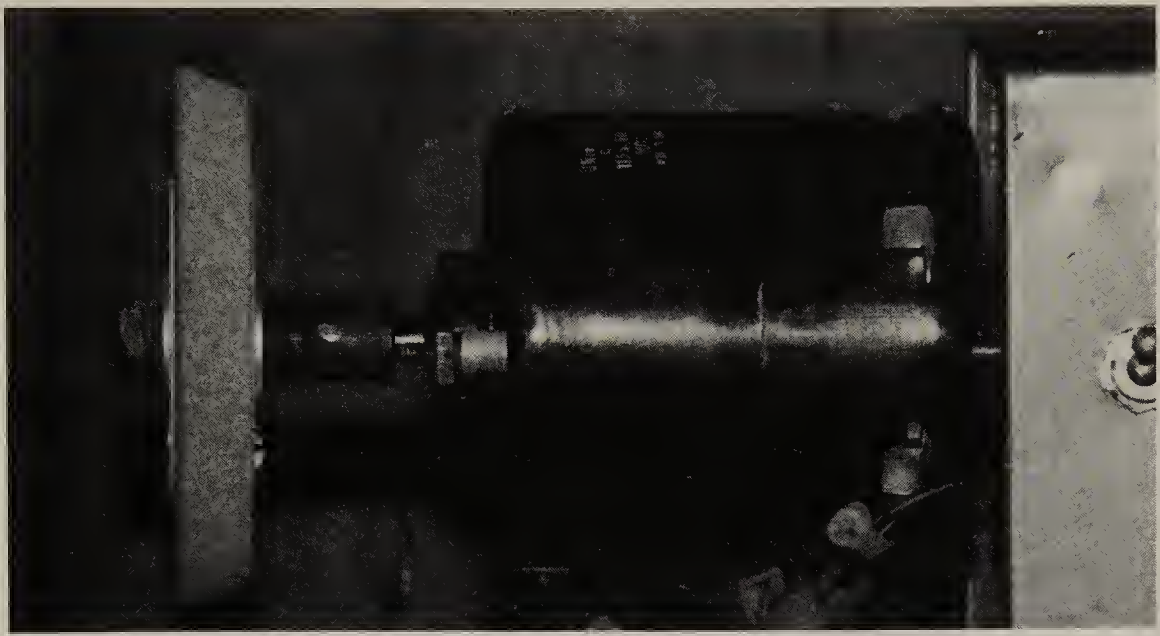
A faster way to taper the guide feet is with a grinder. It does require more control, however. Avoid high-speed bench grinders with large, fast-cutting wheels. They can remove metal much too quickly and burn the metal, and it can be very difficult to manipulate a small guide on them. Instead, try a small cutting wheel that can be chucked into an electric drill on a stand or into a rod-building lathe. The latter is especially controllable because these lathes have a foot-operated speed control plus a variety of pulley speeds. Another good tool is a salvaged and converted knife sharpener of the type used on electric can openers. Remove the housing for easy access, and the small fan blade to protect your fingers. If you can't find an actual knife sharpener, the motors are usually rated 1/30 horsepower at 1,550 r.p.m.

When grinding the end of the guide feet, first create the desired shallow angle in a flat configuration. Then rotate the guide from side to side while holding it against the cutting wheel at a slight angle. This will round, or crown, the top of the tapered foot and the sides of the foot. Smooth all contours and remember, don't grind any part of the foot to a razor's edge.

With the increasing use of graphite blanks of small diameter, it is also good practice to check the width of the guide feet. Set the guide on the blank in the general vicinity of where it will be positioned. If the feet of the guide are too wide for the blank, grind a little off each side. Round off the top so there are no sharp edges along the side, and the configuration looks good on the finished rod.

Blanks are not the only thing getting smaller. Some models of guides, expecially the Flealight series and some single-foot models, are quite small. If you use a grinding wheel to dress your guides, all except the larger sizes are difficult to hold. As RodCrafter Jack Justis noted, rod builders were easily identifiable by the number of grooves cut into their right-hand pointer fingernail. These grooves, of course, are a result of getting a little too close to the grinding wheel. There are two solutions I know of. One is to use an inexpensive little tool called a Guide Grinder Holder which holds all sizes of guides. The other is what Jack did. He used a wheel-dressing tool to cut a 45° angle on the face of his grinding stone. This small adjustment allows the necessary clearance for your fingers.

The guide feet have now been tapered and shaped if required. The next step is to smooth all surfaces—top, bottom, and sides of the feet. The usual route is to use fine emery cloth followed by a polishing with crocus cloth, especially the tapered edges.Some



Grinding stone dressed at a 45° angle provides finger clearance when shaping small guide feet.

Guide Grinder Holder holds all guides from size 6 to 25 while shaping the feet and protecting the fingers.

rod builders use a hone for this final polishing, and the "fine" grade Eze-Lap tool is an excellent one.

For quite a few years now, I've been using a tool suggested to me by RodCrafter Don Doggett, a small wire-brush wheel. It is the type that is already mounted on a ¼-inch arbor, ready to be placed in a chuck.I use my rod-building lathe, but it works perfectly well in a stand-mounted electric drill. Instead of polishing the guide foot with fine abrasive, the revolving wire bristles actually burnish the metal. Just hold the tapered and shaped guide foot against the spinning brush and move the guide around so the brush hits the foot at all angles. Any knife edges will be removed and the metal will be burnished bright and smooth—all in about 10 seconds.

Whatever method you use to polish the guide feet, it's important that you clean them afterward. A cloth moistened with a mild solvent such as alcohol will remove any residue. If you skip this step, you may get blotches on your thread wraps sometime and wonder where they came from.

As I write these steps, they seem a lot lengthier than they really are. It actually takes very little time for what is a truly important operation. After you have done a few sets of guides and have all the materials handy, you breeze through in a matter of minutes.

Many models of guides now have a black finish. When grinding or smoothing the surface of the guide foot, this black finish is removed. If you use color sealant or NCP thread there will be no problem. However, if you use regular thread (not NCP) *and do not use a color sealant*, the thread becomes translucent. This results in bright metal spots showing through the wraps. It is assumed, of course, that you did not use color sealant because you wanted a consistent translucent effect without metallic highlights. To correct this, cover the bright metal spots with black model paint.When the paint is dry, seal it with a barrier coat of clear white shellac or a water-based color sealant such as Brilliance. This will assure that the paint will not be lifted by any solvents in your wrapping finish.

GUIDE SPACING

The selection of the proper guides, their number, and especially their placement are the key elements in producing a superior custom rod. Mass-production techniques simply do not allow time to determine the proper guide spacing for each individual blank to be used with a specific reel and a certain line and lure weight. Instead, guide spacing is plotted for an *average* blank with an *average* reel and an *average* line and lure weight. Every rod of that model is then wrapped with the guides spaced accordingly. By contrast, the custom rod builder can take the time to fit the guides and spacing to the variations of the *specific* blank to be used with a *specific* reel and *specific* line and lure weight. Then, and only then, will the rod cast the maximum distance with maximum accuracy, have stress distributed properly, and keep line wear to a minimum. This is in addition to functionally fitting the rod to the angler and modifying the action to best fit his style of casting.

The important element we are concerned with in this section is the proper number of guides and their correct spacing. I receive more inquiries and questions on this subject than on any other aspect of rod building. The staff of my rod-building-supply business have the same experience and spend many hours each day on the telephone and writing letters in an attempt to answer these questions. From this I can only conclude that there is a real thirst for knowledge in this area.

Many of the people requesting information on guide spacing expect a simple table that will show where each guide is placed on a certain model blank. Or, they would like an ironclad formula that will always indicate exactly where guides should be placed on any blank. Without realizing it, they want a factory approach to guide spacing. In so doing they are surrendering one of the most important controls the custom builder has for making a better rod.

Perhaps I am partly to blame for this, since I did list some tables in *Fiberglass Rod Making* as starting points for the beginning rod builder. I tried to emphasize that they were only "suggested locations" and stated that "it is best if you treat these and all such charts as only starting points, since no two rods bend exactly alike." Since that book was for people new to the art of custom rod building, I tried to simplify things—perhaps too much so. In any event, here we are concerned with advanced techniques and therefore need to fully understand the factors and principles that determine proper spacing. Once these concepts are understood, we can space guides for maximum performance on any rod.

Let's start with the number of guides to be used on a rod. Before I throw any numbers around, let me emphasize that the precise number of guides will not be determined by the knowledgeable rod builder until he is making the tests to determine proper spacing. In other words, it is rarely possible to know beforehand exactly how many guides will be required. All anyone can know at the start is the probable range of numbers of guides. The numbers given below, then, indicate that range and are offered only as a point from which to start.

Conceptually, it must be remembered that the number of guides used is always a compromise. Within practical limits, the more guides we use the better we can distribute stress along the rod blank. On the other side of the coin, the fewer guides we use, to a practical limit, the less friction is present and the greater the distance we can cast and the less wear there is on the line. And there are other limiting factors. The more guides, the more weight is added to the rod. The action can be slowed too much, or even ruined entirely. If there are too few guides, the line will slap against the blank, creating friction. This reduces casting distance and line control and increases line wear.

With the above cautions firmly established in your mind, the *probable ranges* for the number of guides can be considered. *Fly rods* using snake guides generally require slightly more than one guide per foot of rod length. For fly rods of from 6 feet to 9 feet in length, this will translate to about seven to eleven guides. Fly rods using Fuji single-foot guides generally require one guide per foot of rod length. In all cases for all rods, we are here talking about the *probable* number of guides, including the butt or stripping guide and not counting the tip-top. Also, always round up to the next higher number. For example, let's suppose we have an 8½-foot fly rod on which we are going to use Fuji single-foot guides. Not counting the tip-top, we would *probably* need nine guides, one of which would be the butt or stripper guide and therefore (by tradition) a two-footed guide.

Spinning rods. A quick rule of thumb to determine the probable number of guides is to subtract one or two from the rod length. For example, a 6½-foot rod would probably need five to six guides.

Casting rods. Here, we can get a quick indication of the probable number of guides needed by subtracting one from the length. For example, a six-foot rod will probably require five guides.

Surf rods. This often gives people trouble because some people want to use only four guides no matter how long the surf rod. A much more realistic projection is to divide the length by two. For example, an 11½-foot rod will probably need at least six guides.

Trolling and boat rods. If these are traditional East Coast rods, they will usually require either five or six guides. Pacific stand-up fishing rods will require more guides. These rods can vary so much in design that the only way to determine the number of guides is by a stress-distribution test as explained later.

Again, in case the word "probably" didn't remind you, these numbers are only "for starters."

Another area where people always seem to want some assistance is in selecting the size of the butt or stripping guide for a given rod. Frequently, a number of factors may influence the selection. The only way to be certain is by the tests explained in detail later in this chapter. Again "for starters," here are some guidelines to help you select the *probable minimum size* butt guide.

Fly rods. If the rod is one for a #5 weight fly line or lighter, then a size 10 or 12 stripper will probably do the job. If the rod is for a #6 weight fly line or heavier, then a size 12 or 16 stripper is probably called for.

Casting rods. As we'll see, the width of the reel spool is the predominant variable. If the rod will be mated with a narrow-spool reel, a size 16 butt guide is usually the best. If a wide-spool reel is going to be used, step up to a size 20 butt guide.

Spinning rods. Everyone knows the guides are bigger on spinning rods. Quite a few variables determine the size of the butt guide, not the least of which is the height of the guide. For our rough rule of thumb, let's consider only the pound test of the line that will be used on the rod. If it is four- to six-pound test, then the probable minimum size is a 20. For a rod casting line in the eight- to 12-pound category a size 25 is probably right.

When the line is over 12-pound test, a minimum size 30 is generally recommended. If you are undecided, limp line will enable you to use a smaller guide while stiff mono will mean moving to a larger guide.

To determine the proper spacing of the guides, you will need to perform both casting tests and static tests. The casting tests will help you determine the critical placement of the butt guide, which is so important in achieving maximum casting distance. The static tests locate the positions for the remaining guides to assure proper stress distribution along the blank. With the possible exception of fly rods, you should make your tests using the same reel that will be fished on the rod. The reel should be equipped with the weight or pound-test line that will usually be employed with the rod. For the casting tests use the proper range of lure weights, for which the rod is designed.

While conducting the tests it will be necessary to move the guides, particularly the butt guide. The guides can be held in position with strips of masking tape. Cellophane tape is not as good, since it can leave a sticky residue on the blank and the guide feet which will later interfere with wrapping and finishing. Masking tape works well, but it does require removal and reapplication each time a guide is to be moved. Taping and untaping the guide feet many times, as is often necessay, can become a nuisance. Rod-Crafter Jim Cunningham introduced me to a better way that you might want to try.

Instead of tape, Jim used very elastic, thin-wall micro latex tubing. Originally we made do with one size, but later experiments showed us that if we equipped ourselves with three sizes we could cover everything from fine graphite tips to the butt sections of most rod blanks.

The tubing is cut into bands a bit shorter than the guide feet. These bands are mounted on the blank before the tip-top is installed. If at that stage you are not quite sure how many guides will be needed, add two more small bands for the possibility of an additional guide. To mount the bands, first moisten them, then slip them over the tip of the blank. From there they are *rolled* (rather than slid) down the blank to the starting position for the butt guide. The initial bands would be cut from the larger-diameter tubing. As you move up the blank, use bands from the smaller-diameter tubing. This procedure is continued until there are two bands for each intended guide in their approximate starting positions.

When it is time to place the guides on the blank for the test casting and the static test, it is a simple matter to hold a guide in the desired position and roll a latex band over each foot. During the testing when it is necessary to move a guide from spot to spot just roll the bands off the feet, move the guide and roll the bands back on. It is much, much faster than taping and untaping. During the test casting the guides are held firmly in place. Because it's so easy, you can fully explore the possibilities of placing the guides in more positions. As a result, you do a better job of achieving the best possible guide spacing. We like it so well that we even gave it a name: Guide Placement Aid.

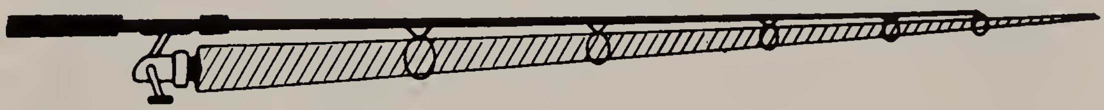
On extremely small-diameter tip sections, you can stuff a round toothpick in with the guide foot, then break it off so that only a tiny piece remains. You will rarely need to do this, and even then on only the top one or two guides. When perfect spacing is achieved, you have the option of leaving the latex holding the guide. Then, when wrapping, push the band toward the guide ring, start the wrap over the foot, and snip the latex with a small pair of pointed scissors or slice it with a razor blade.

Now, let's discuss the techniques for working out the actual guide spacing. We will consider each type of rod separately and place a good deal of emphasis on locating the proper position for the very important butt guide. Before starting, locate the effective spine of the blank and determine on which side of the blank the guides will be located as explained in the chapter on the blank. Mount the tip-top. (As noted in the chapter on glues and gluing, use five-minute epoxy.)

Spinning rods

As we all know, the spool of a spinning reel is stationary and the line unfurls from it as it is pulled through the guides by the weight of the lure. At the tip end of the rod, the line must pass through a tiny hole in the tip-top. The line, however, originates near the other end of the rod from a comparatively large-diameter spool. It is the passage from reel spool to tip-top over the length of the rod that gave rise to the "cone-of-flight" theory of guide placement. If you look at a side view of a spinning rod and what seems to be the path of the line, you can easily project the long cone. This is a helpful concept for some people. However, if you adhere to it too strictly for the placement of guides, improper positioning and guide sizes that are too large will result. I would like to explore this theory in some detail because I feel the rod builder can learn much about the principles for spacing guides not only on spinning rods but on all rods.

Basically, the theory says that each guide must have a guide ring large enough to clear the cone of flight at that point on the rod. Advocates suggest that the butt guide be secured to the blank one-third of the distance from the reel lip to the tip-top. The line is then strung from the lower lip of the reel through the butt guide and to the outside of the tip-top ring with all the remaining guides hung on the line. Most rod builders who have tried this find the weight of the guides pull against the line, preventing it from forming the desired straight line. If you are going to attempt to follow this approach, at least first attach all the guides temporarily to the blank and *then* run the line from the spool lip to the tip-top. The guides will then not dangle loosely in a mass on the line, distorting it.



Cone-of-flight theory for spinning rods.

The cone-of-flight theory then suggests that each guide be positioned along the rod so that the line just misses touching the inside of the guide ring that is farthest from the blank. It is suggested that the butt guide be the first to be slid along the blank to this desired position. If the butt guide must be moved more than 6 inches from its starting point toward the tip, or if it must be moved onto the tip section of a two-piece rod, then the butt guide is too small and we must use a larger size.

This is the basic premise of the cone theory: By not having the guides choke the line, distance-robbing friction is avoided or minimized.

We'll examine whether this is so in a moment, but first let's see what happens if we follow the theory. If you try the above method on most rod-and-reel combinations, you will find you need an exceptionally large butt guide and adjacent guides—so large, in fact, that their weight is too much for the blank and greatly slows the action or destroys the action.

The rod blanks of even ten years ago had a much better chance of carrying extra weight. Our modern blanks are becoming lighter and lighter, and are engineered for a high degree of responsiveness. One of the worst things we can do is to hang a lot of weight on them. Not only would we rob them of performance and make them sluggish, but in some cases we would weaken them. Another disadvantage of large guides is that they have a lot of aerodynamic resistance. This wind drag impedes the movement of the rod through the air, robbing the caster of tip speed and, hence, distance.

When you think about it, the cone-of-flight approach has to use large ring guides. If the butt guide is to be one third of the distance from the reel to the tip, and the cone must fit inside that guide, then simple math dictates that the butt guide be two thirds of the diameter of the reel spool.

To be fair, the advocates of the system do point out that it is not attainable every time and that compromise must be exercised for many reasons. They acknowledge that guide selection and guide placement for spinning rods is a complex affair, more difficult than for other types of rods. Perhaps we can unravel some of the mystery, if not the complexity.

First of all, the line does not follow the exact straight line depicted in the cone of flight from the outer edge of the reel lip to the tip-top. Instead, it unfurls, or billows out, in wider loops than the diameter of the spool. It must in order to leave the spool. If it did otherwise it would generate a great deal of resistance and friction as it crossed the lip of the spool. The pound test line on the spool and whether it is limp or hard monofilament will determine by how much the line springs away from the spool as it comes off. The heavier the line, the more it spreads out as it leaves the reel. Also, the harder the type of monofilament, the more it springs into larger coils as it unfurls. The diameter of the coils increases even a bit more as it moves away from the reel.

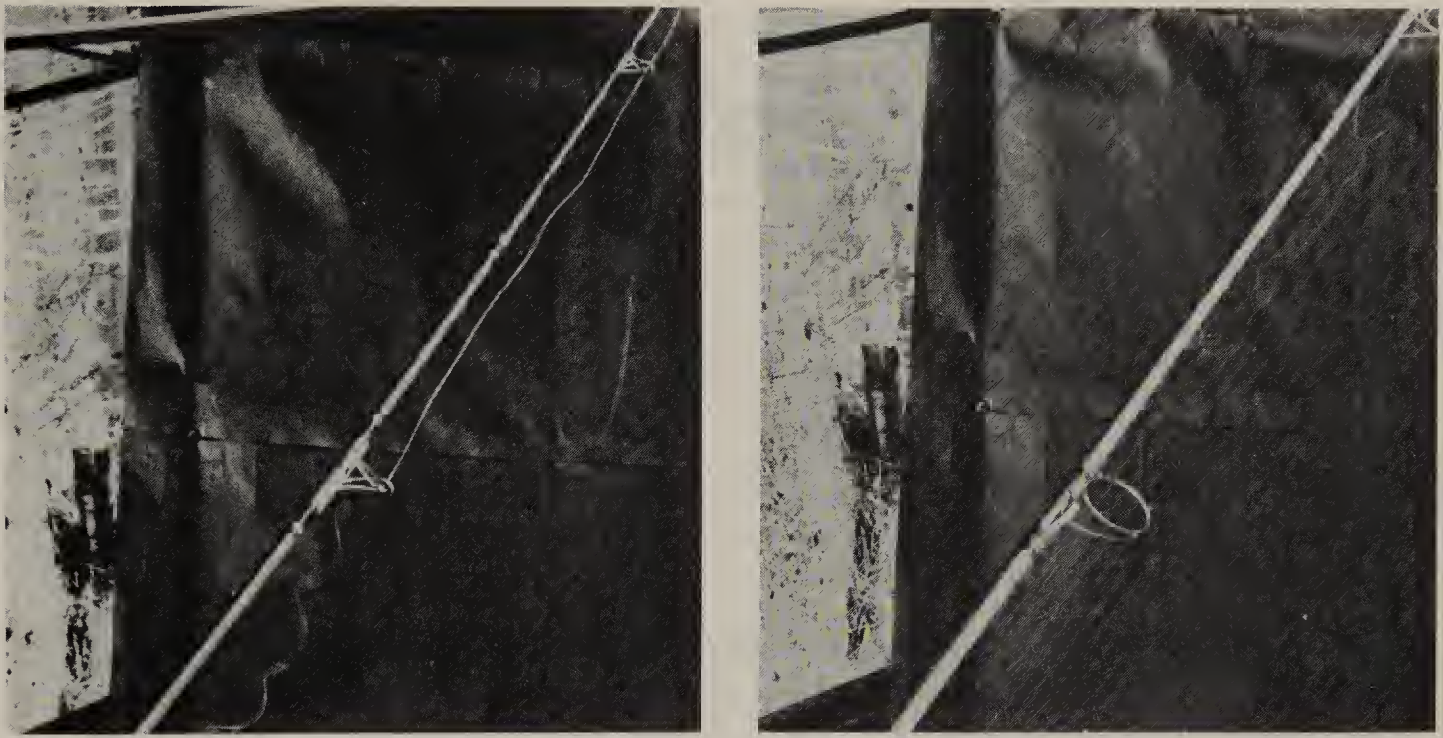
By this time it must be obvious that the butt guide, of necessity, will have to choke the unfurling line and start the process of reducing the diameter. Even if the butt-guide ring were as big as the diameter of the reel spool, it would choke the line somewhat. It is this necessity of the butt guide to choke the line that really defeats the cone-of-flight theory.

Cone advocates assume that the butt guide generates only a small amount of friction since it chokes the line only a little. However, each successive guide chokes the line in turn as the line is funneled down the rod. The amount of distance-robbing friction, then, is the total from all the guides. An interesting fact emerges here: Purely from a friction standpoint, it doesn't matter very much if you do most of the choking with the first one or two guides or if you spread it over all the guides (the cone theory); the total friction will be about the same. Keep that point in mind.

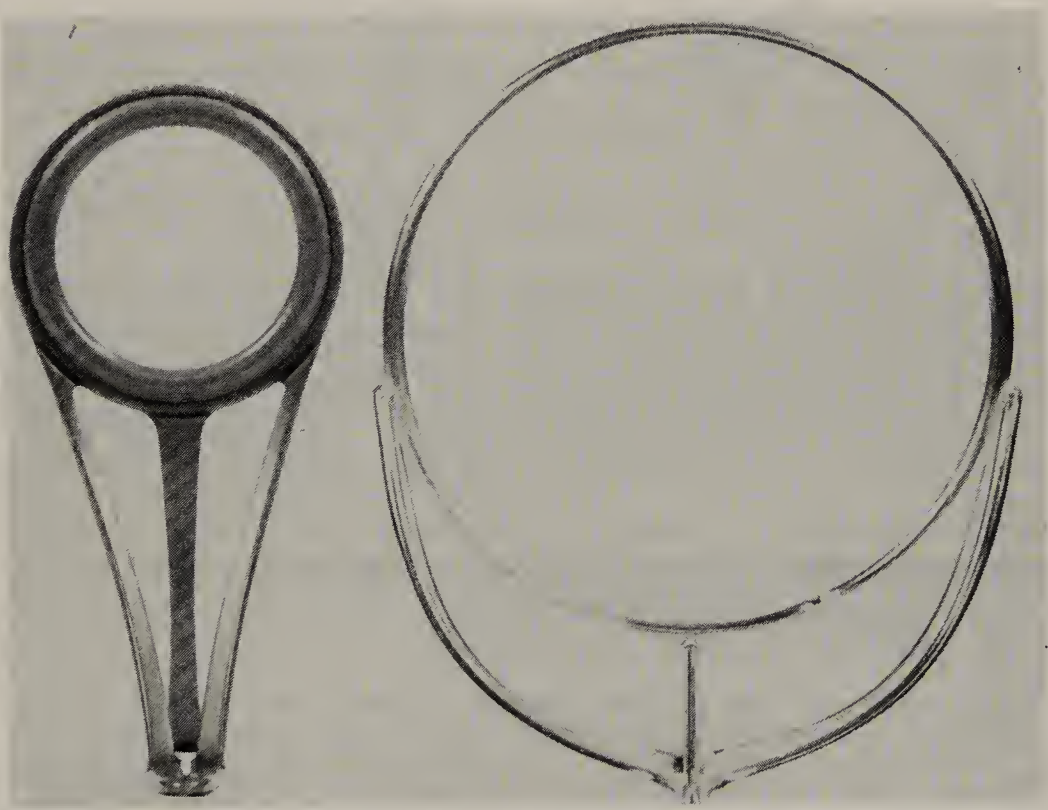
Most fishermen believe that the friction of the line on the guides is the greatest factor in reducing casting distance. That's really not true. When line slap is present, it will reduce distance much more than friction. What is very important to our discussion here is the fact that line slap is *always* present when large, low-sitting guides are used—and that is what the cone-of-flight theory calls for, large, low guides. The line will slap against the blank at various points because it is unfurling in loops and the big guides do not adequately contain it or bring it under control.

To eliminate line slap, we must use a higher-frame guide, one that stands off farther from the blank. By higher we mean a guide on which the bottom of the guide rind is farther away from the blank. You can easily compare the height of two guides by setting them side by side on a table. Check the *inside* of the bottom of the guide rings to see which is higher from the table.

A high-frame guide holds the line away from the blank. This height is especially important for the butt guide because it's the first guide to contact the line coming from the spool. The butt guide must also start to choke the line coils, reducing their diameter,

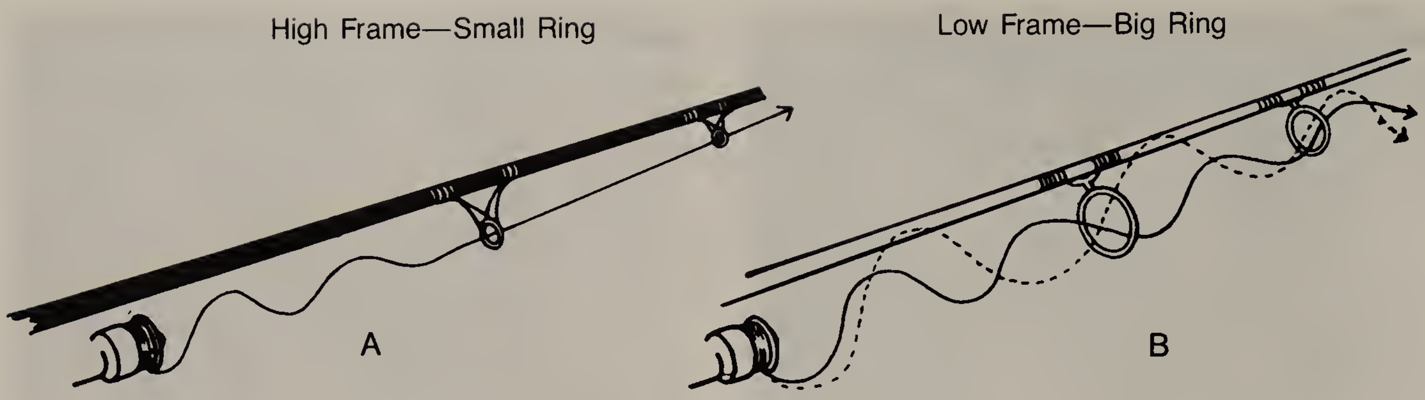


Guide comparison: *Left photo*—The high frame and small ring hold the line away from the blank, preventing line slap. After the line passes through the butt guide it is perfectly controlled. *Right photo*—the low height and large ring never bring the unferling line under control. The line is free to slap the blank both before and after passing through the butt guide.



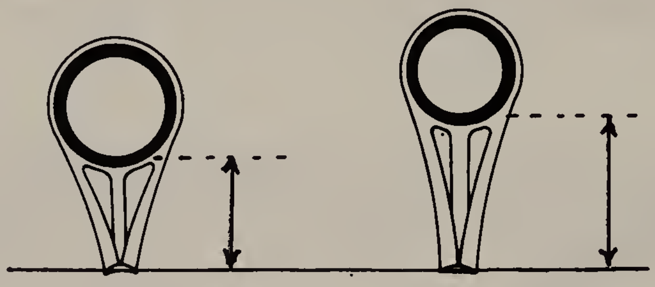
A perfect example of the two kinds of butt guides for surf spinning rods. On the left is a Fuji 40HH high frame and on the right is a Perfection size 75 wire guide.

thereby straightening the line and bringing it under control. If we use a smaller-ring, higher-frame guide we will generate more friction at the butt guide but less on the successive guides. Total friction will be about the same but line slap will be eliminated.



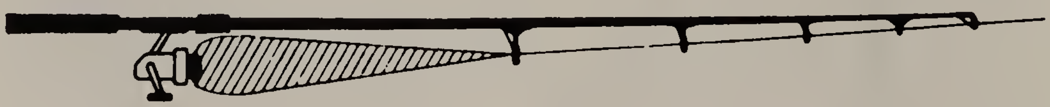
Height of butt guide is important. Top: guide sits too low, causing line to slap against blank.
Bottom: High guide eliminates line slap.

All right then, we need high-frame, smaller-ring guides, especially at the butt end. If these guides are properly positioned, we should be able to get maximum casting distance. The actual ring size and distance to the butt guide is dependent on the power of the centrifugal force of the line. The distance is proportional to the speed and the weight of the line.



The difference in height to the inside of the bottom of the ring is easily compared.

Before we get caught up in a technical morass, let me say there are a great many factors that have an effect, more or less, on the proper sizes and placement of the guides. Fortunately, we need only be aware of some of them, such as the rather obvious fact that the smaller the diameter of the reel spool, the smaller are the coils of unfurling line. We have already mentioned it, but the pound test and type of line (limp or hard) are very important. Lighter-test, limp monofilament comes off the reel spool on smaller coils with less mass and force and is more easily choked with less friction by the butt guide. If that is what will be used on the rod we can use a butt guide of smaller ring size. If heavier-test, hard mono is used, just the opposite is true. You can easily check this out yourself.



Controlling flight of line with a higher-frame, smaller-ring butt guide.

An example of the effects of line comes to mind immediately. It seems that most of the surf fishermen for whom I've built rods were using 20- to 25-pound test, abrasion-resistant (hard) line. Like all surf fishermen, they wanted a rod that would cast farther. I could deliver dramatically when I could convert them to using 12- to 15-pound test limp mono with a heavy shock tippet. Part of the dramatic increase in casting distance was attributable to my custom rod. The other part came soley from lighter, limper line.

Earlier in this chapter we talked about rough rules of thumb for estimating the probable size of the butt guide for the different types of rods. At that time we mentioned that while there were many variables with spinning rods, we would base the size of the butt guide on the pound test of the line. Heavier and harder line will have more of a tendency to pile up against the butt guide in a powerful cast. It is one of the reasons why larger butt guides are needed as you move up in pound-test ratings.

It is no wonder, then, that proper spacing of the butt guide can be determined only by test casting. There are simply too many variables to provide for in a simple formula. This is also why the spacing must be done with the reel and line which will be used on the rod. However, before test casting, we have to put the guides *someplace* on the blank. These are what I keep referring to as "starting points"—tentative, educated guesses from which we will reposition the guides as necessary by further tests.

Starting points for the butt guide on spinning rods can be in the vicinity of one-third of the distance from the reel spool to the tip-top. In terms of inches from the center of the reel seat, you might try: 18 to 25 inches for short ultralights, 22 to 30 inches for medium spinning, and 28 to 36 inches for surf spinning. The distance of the first guide below the tip-top should not be more than 5½ inches. The guides in between can simply be placed by eye with the distance increased progressively toward the butt. Or you can use a mathematical calculation for an even progression. Examples of some formulas are given later. However, most rod builders who use both casting and static tests do not find it necessary.

With the guides at their starting points, the line strung through the guides, and the proper lure weight attached, start casting on flat, clear land. The first thing to check for is line slap against the blank between the reel and the butt guide. This can often be heard, or if the light is right so that it reflects off the line, it can be seen. Two probable places where the line might slap are about two thirds of the distance between the reel and the butt guide, or right in front of the foot of the butt guide. Some rod builders place a length of cellophane tape on the blank at these two spots as an aid. If the line is slapping against the blank, it will leave marks on the tape. If you detect line slap, move the butt guide a short distance and repeat your casting. Try moving the butt guide in both directions from the starting point. Obviously, if the butt guide gets moved very far from its starting point, you must adjust the other guides accordingly.

Occasionally while testing, especially with longer rods and heavier line, you might hear a pinging sound coming from the reel spool. If so, it means that the butt guide is too close to the reel. The line is being choked too much and too soon, and the line is setting up friction as it is pulled over the lip of the spool. Move the butt guide farther from the reel and repeat your tests.

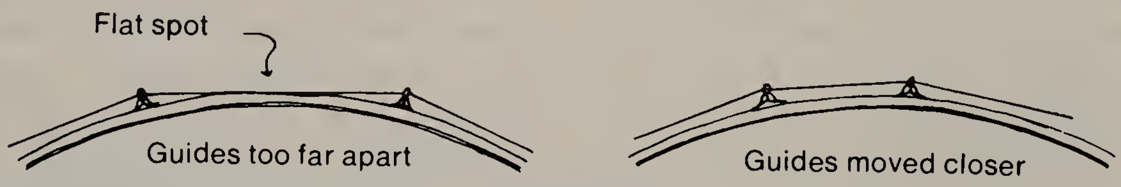
If, during your testing, you find that you cannot eliminate either line slap or pinging without moving the butt guide onto the tip section of the rod, you probably need a larger-diameter and/or higher frame guide. The same would be true if you cannot attain the casting distance normally expected from that specific rod. If you change a butt guide, also adjust the sizes of the other guides, especially those closest to the butt guide.

Test casting and repositioning of the butt guide, and sometimes the other guides, continues *until you find the point where maximum distance is achieved.* It helps if your casting field has some reference points to help ascertain relative distance. A lined football field is ideal, but rocks, sticks, shrubs, etc. will work just about as well. After a little experience with this test-casting technique, you will be surprised at how quickly you will determine the correct distance for the butt guide.

Leave the guides in exactly the final position from test casting for the next step, the static test for proper stress distribution. The reel remains mounted and a few feet of line should extend beyond the tip. Either have someone hold the rod for you, or mount it at about a 45° angle with the guides on *top* of the blank (upside down from normal).

An easy way to mount the reel if you are by yourself is to put the rod's butt grip in a drawer, then close the drawer. To protect the grip from denting, wrap it in a clean cloth or similar padding. Turn the reel so that the line-pickup roller is away from the blank, and lock the reel with the anti-reverse lever.

You want to put the rod in a moderate bend. There are two ways of doing this. One is to tie the line to an immovable object at floor level to form an approximate 45° angle. Then tighten the line and lock the reel as above. The other method is to pull down on the line to put the rod in the moderate bend. If you take this approach, don't pull straight down from the tip. Instead, pull at about a 45° angle. The amount of bend you want to put in a light rod with either method would be about the maximum flex reached in a powerful cast. With heavier or stiffer rods, the rod should be flexed a bit more. Now check along the line to see if there are any flat spots. These are points at which the line is touching the rod. The line should run from guide to guide without touching the blank. If you find a flat spot, then the guides are too far apart and you will have to move one of the guides closer. Always move the guide nearest the butt end (but not the butt guide itself) toward the tip. When you shorten the distance from one guide to another in order to eliminate a flat spot, you are also lengthening the distance between the guide you moved and yet another guide—possibly creating another flat spot. For this reason it is best to work from the tip of the rod back toward the butt. You can see how handy Jim Cunningham's latex bands are when you move a number of guides.



To determine stress distribution, position rod with guides up in a workable are.

When making this final adjustment in guide spacing *do not move the butt guide.* Also, you will probably find that you could move the first guide below the tip-top farther away from the tip-top than 5½ inches and still not have the line touch the blank. Don't do it! You need that support on the fragile tip section. It can be as close as 4 inches, but not farther away than 5½ inches. The only exception would be on quite heavy, stiff blanks with a large-diameter tip.

If, when conducting this test, you find that you cannot eliminate all the flat spots with the rod bent as suggested, you need to add another guide. Or, you may be able to eliminate the flat spots, but only with a wildly exaggerated pattern of spacing that obviously looks wrong to you. Here again, you should add another guide. Add the smallest-size guide possible at the tip end, and once more work back toward the butt in establishing the new spacing. Sometimes the addition of a guide makes it necessary to change the sizes on a few other guides. Try to confine such changes to the small guides.

Fly rods

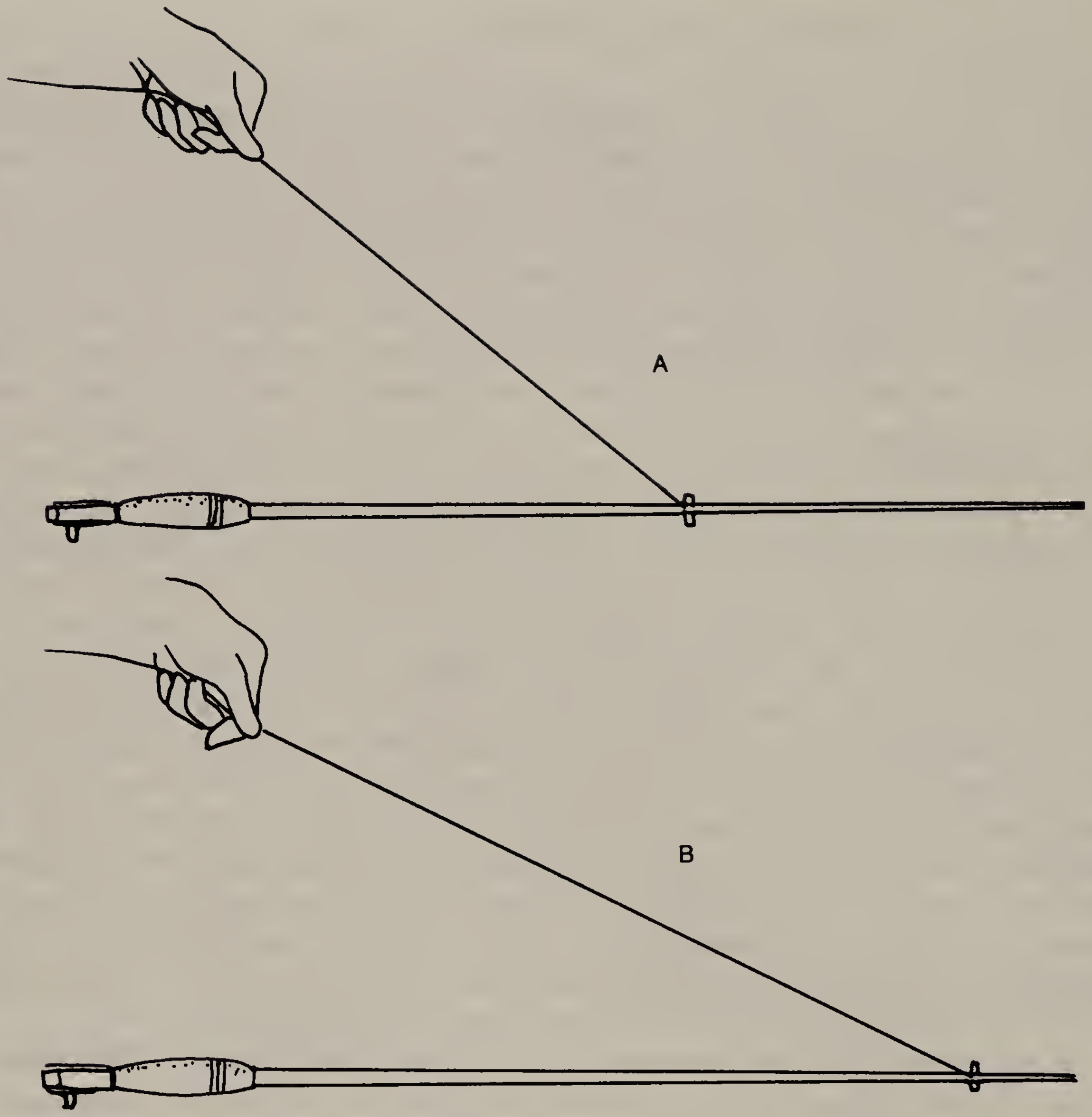
There is no "cone of flight" of unfurling line on a fly rod. In fact, the line does not even come from the reel, but comes instead from the left hand (for a right-handed caster). At least it is initially fed from the left hand. It ultimately may be shot from loose line on the water, the boat deck, or stripping basket. It therefore must pass through the stripping (butt) guide at an angle. The farther away from the reel the stripping guide is placed, the less the angle at which the line passes through the guide, and the less is the friction. However, there are definite limits to how far up the rod the stripping guide can be placed. If it is too far, the line will slap against the blank, greatly reducing the casting distance. Again, a compromise is necessary. We want to keep friction on the stripping guide at a minimum (for distance and line wear), but we don't want to run the chance of the line slapping the blank on a powerful cast. A good starting point for locating the stripping guide is 28 to 35 inches from the base of the reel seat. This distance will vary with the length of the rod, with the shorter measurements applicable to shorter rods. It may also vary somewhat with the preference of the angler and his particular casting style. A fly fisherman who shoots line usually prefers the stripping guide a bit higher on the blank.

There is no doubt that line slapping against the blank is a great distance-robber. If the angler is a powerful caster, the force of the line hitting the blank over a long period can actually damage the blank. I've seen two such cases where the blank walls were beginning to crush. One was a West Coast steelheader and the other a saltwater angler. One technique that will allow you to place the stripper guide with less chance of line slap is to turn the guide about 25° to 45° to the left or right of center, depending upon whether the fisherman is a right- or left-handed caster. If you do this, it also helps to use a larger stripping guide such as a 16 or 20 high-frame guide. The larger guide will more quickly funnel line up the rod and keep it from piling up at the butt guide.

The first guide should be about four to five inches below the tip-top. The balance of the guides should be spaced proportionate to the taper for even stress distribution. On blanks that have basically a straight taper, this means the spacing can usually be of evenly increasing increments. Thus a mathematical formula for progressive guide spacing works out quite well. On the other hand, if the blank is a compound taper with an action that is mostly tip-oriented, then the guides should be spaced closer together near the tip. This type of rod will generally cast better if it has an additional guide over the norm, and if that guide is spaced among the first few below the tip-top.

After attaching the guides, do some test casting to check the position of the stripping guide. If the rod does not seem to cast as well as you think it should, try adding a guide near the tip section. Also, if you detect line slap or excessive line friction against the blank, it may help to add an additional guide.

While the rod is strung with line, run a simple stress-distribution test. This does not have to be as elaborate as for spinning rods. The technique of checking for flat spots will not work here, since the guides sit too close to the blank. Instead, support the rod up at about a 45° angle with the guides below the rod in their normal position. Lock the line to the reel with a rubber band, or have someone hold it while they hold the rod. Pull down on the line projecting beyond the tip and place the rod in a bend comparable to that produced in fighting a fish for which the rod is intended. Check to see that the line follows the pattern of the bend in the rod. There should be no excessive line angle. Where the rod bends the most, the line should be supported with the most guides. Move any guides necessary to achieve an even distribution of stress. In the final analysis, this should be used to determine the spacing between each guide, but do not move the butt guide.

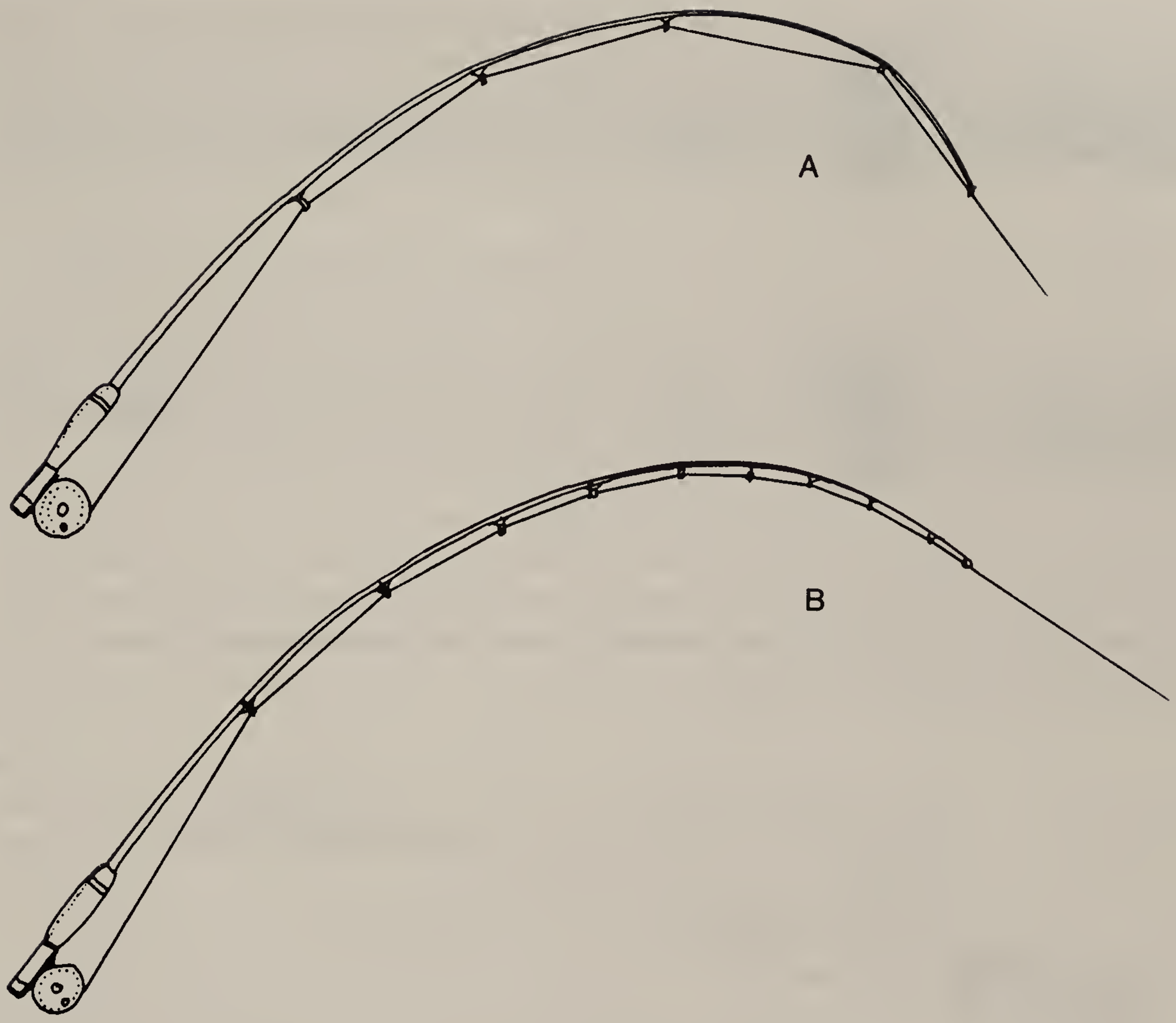


A: Stripping guide on fly rod placed too close to grip, resulting in sharp angle, excess friction, and unnecessary line wear. B: Stripping guide moved farther from grip reduces angle and accompanying problems.

Casting and trolling rods

Some rod builders believe that placement of the butt guide on casting and trolling rods is not a particular problem, since the line comes from a single point source directly through the center of the butt guide. If we stop and look at a reel we find the line comes off of it in a side-to-side motion over the width of the spool. (The only reel that does release line from a single point is a closed-face spin-cast reel.) Since the line from a casting reel is unwinding from side to side, it intersects the butt guide at various angles. The wider the reel spool the greater the maximum angle, and the more friction against the sides of the butt-guide ring. Friction, of course, is what we have to minimize for maximum casting distance and minimum line wear. While the wider reel spool frequently has greater line capacity (often more than needed), it automatically creates more friction at the butt guide. Incidentally, this is one of the reasons why the narrow-spool design casts so well.

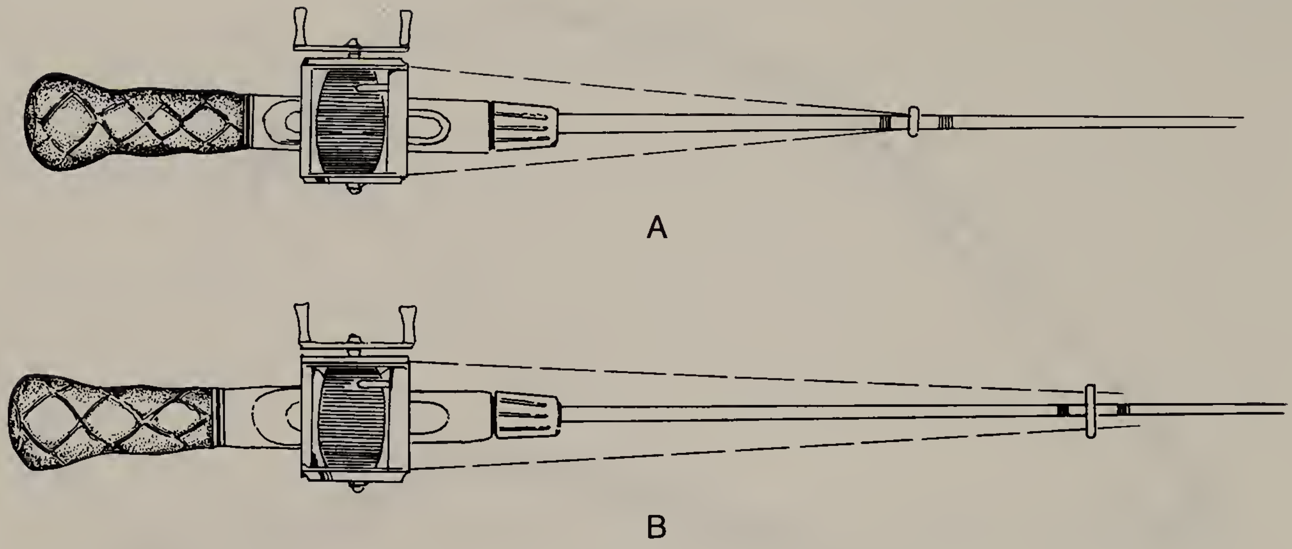
Proper placement of the butt guide is critical for the custom rod builder. If the guide



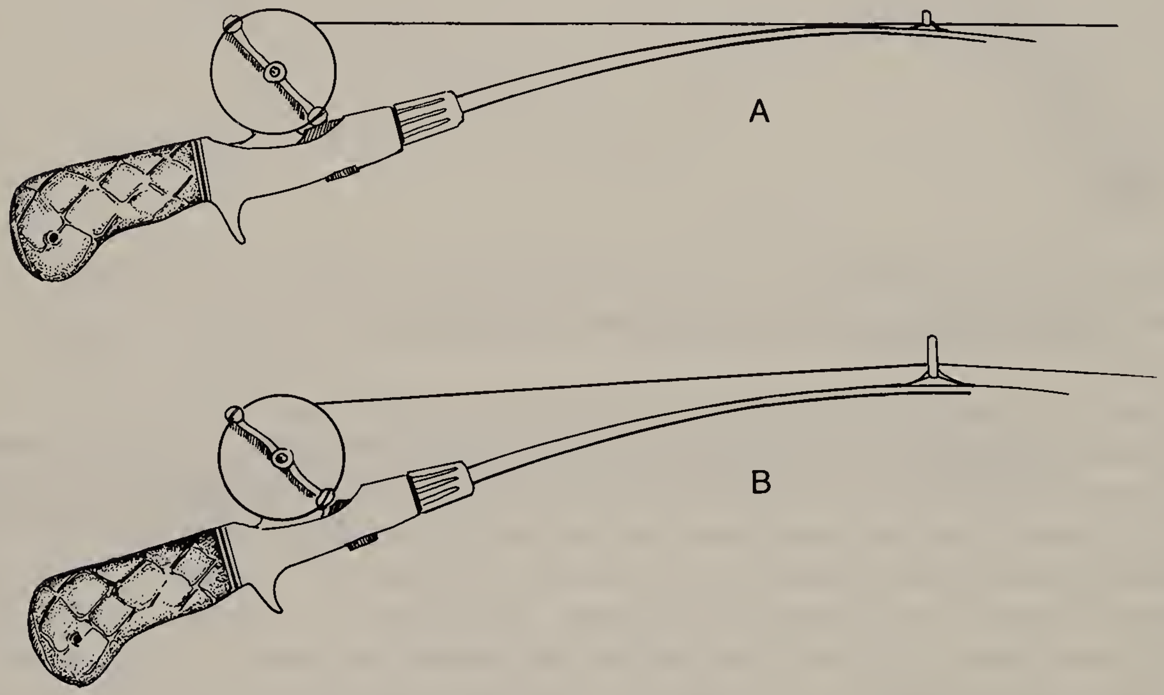
Fly-rod stress-distribution test. A: Too few guides and excess stress on rod blank. B: Proper number and spacing of guides distributes stress properly.

is placed too close to the reel the angle of the line at the guide is great, and too much friction is generated. On the other hand, the angle of the line to the butt guide is reduced the farther away from the reel that the guide is placed. If this was the only problem we had to contend with, we could solve the problem by mounting the butt guide at a great distance from the reel. However, if we place the butt guide too far away, the line will slap against the blank. Also, when the rod is bent sharply from a heavy fish, the line will be pulled down across the blank, the foregrip, and possibly the hand. So, once again, it is necessary to compromise. The object is to position the guide as far from the reel as possible *without* having the line slap the blank or be pulled across it when the rod is sharply bent.

All of the above assumes that we use a certain-size butt guide. We can do much to help solve the problem by using a larger butt guide. The bigger diameter of the guide ring chokes the line less in its side-to-side travel. Or, to put it another way, it reduces the angle from the side of the reel spool to the side of the guide ring. This helps reduce friction on the cast. Another aspect of guide design can by employed in the solution to our problem. If we use a high frame guide which holds the ring higher off the blank, it helps prevent the line from touching the blank when the rod is bent sharply. The higher frame also helps eliminate line slap against the blank. This means a high frame guide can be placed farther from the reel, which, you will remember, reduces friction on the line. There is no doubt that a larger-size butt guide on a higher frame will increase casting distance, reduce line wear, and even provide more comfort and ease in fighting a large fish.



Size and placement of butt guide on casting rod are critical. A: Too small a guide placed too close results in sharp angle from sides of spool and excess friction. B: Larger guide farther from reel reduces friction.



Advantage of higher and larger butt guide on casting rod. A: Too low and too small a guide allows line to rub against blank. B: Higher, larger guide holds line away from blank.

At this point you might ask why factory rods are not so equipped. Keep a number of points in mind. Tradition is hard to break, and factory rods must be made to look sleek for sales purposes. The average fisherman is not knowledgeable enough about this problem, and he'll be more likely to pick the sleek-looking rod from the dealer's rack. The sales departments of rod companies realize this. Also, from a financial standpoint, the larger guide costs a bit more. When you are marketing many thousands of rods on a relatively small margin of profit, every factor of cost must be considered.

To determine guide spacing we need to attach the guides, mount the reel to be used with the rod, and run line through the guides. As always, we need to have some starting points at which to place the guides. For the butt guide try 16 to 24 inches from the reel on casting rods, and 20 to 28 inches on longer trolling or boat rods. The balance of the guides can be placed by eye, or by using a formula for an evenly increasing spacing progression. Use a high-frame butt guide about one size larger than normal. The wider the reel spool, the larger should be the butt guide. Fasten the end of the line to a fixed object on the floor.

Revolve the reel while keeping light tension on the line and observe the angle of the line as it intersects the butt guide. If, as the line travels back and forth, it seems to be choked quite a bit by the butt guide, move the guide farther up the rod. Now put your thumb on the reel to lock the line and lift the rod. Put a bend into the rod comparable to fighting the largest fish that will probably be encountered with that particular rod. With the rod so bent, check to see if the line touches the blank or the foregrip. If it does, you will have to move the guide closer to the reel and try again. If the line does not touch, try moving the guide a bit farther away from the reel and repeat the test. You want to place the guide as far from the reel as practical without having it touch the blank or the foregrip when the rod is bent sharply.

When you conduct this test, the previously discussed advantages of a higher-frame guide that holds the line farther away from the blank will become obvious. Also, the advantages of a larger ring will be easily seen. Depending upon your rod, you may want to switch to such a guide to achieve the desired results. Naturally, there are practical limits to the size of the butt guide, especially where weight is concerned. But tip weight is more important and it can be offset by using single-foot guides on the middle and tip of the rod.

Back when we discussed guide-spacing theory for spinning rods, we said that line slap would reduce casting distance considerably more than line friction. That is just as true with casting rods, so always do everything you can to eliminate any line slap first, then turn your attention to reducing line friction on the guides.

A comparatively light boat or trolling rod that is used in the pursuit of larger game fish presents a special problem. Because it is a light rod for light line it will be severely bent by a large fish. When that happens, the butt guide is critical in keeping the line zipping from the reel from touching the foregrip and/or the angler's hand where it could inflict a painful burn. The solution is an *extra-high* frame guide. The guide ring doesn't need to be above normal in size, but it should be as high as possible. Don't be concerned about mixing different model guides to meet your needs on this or any other rod. You can match finishes, (chrome, black, gold, etc.) and retain good cosmetics. Performance is always foremost.

When you have the correct position for the butt guide determined on the casting rod, make some test casts. You want to look for any possible line slap which would indicate you moved the butt guide too far from the reel. Chances are good that you will not find any. If you do, move the butt guide closer a bit at a time until the slap is eliminated.

All that remains is to perform a static test for even stress distribution. This is exactly the same as that described for spinning rods. The object is to remove any flat spots without changing the position of the butt guide. In the process you will find out if it is necessary to add an additional guide, and also determine your final guide spacing.

Roller guides. Offshore trolling rods are designed and built to do battle with fast, powerful fish utilizing a given class of pound-test line. The all-important factor is *line wear,* and that is the reason roller guides are used. The placement of the butt guide is again critical, but this time entirely for the purpose of keeping line wear to the minimum. If the butt guide is placed too close to the reel, the line traveling from side to side of the spool will rub against the edge of the guide housing. This obviously defeats the whole purpose of the roller guides and a line can be quickly worn and broken.

Therefore, the same two factors apply in placing the butt roller guide as apply with a casting rod or light trolling rod: The guide must be far enough away from the reel to eliminate any danger of the line touching the housing, but close enough (and high enough) to prevent the line from touching the fore grip or blank when the rod is bent to its maximum.

To determine proper placement, tape the guides in estimated positions and, using the reel that will be used with the rod, run the proper test line through the guides. As in the test for casting rods, revolve the spool with the line under tension so that line comes off both sides of the spool. Move the butt guide as close as possible to the reel to the point where there is no danger that the line could come into contact with the guide housing. To provide a safety margin, move the butt guide a little bit farther away from the reel. In the balance of the testing, you can move the butt guide farther away from the reel, but do not move it any closer.

Next, test to see if the butt guide is high enough to prevent the line from touching the foregrip or blank when the rod is flexed. The best way to determine how far the rod should be bent for this test, as well as for the next, is with the use of a spring scale. Place the rod in a holder and run the line through the guides and out the tip-top at about a 45° angle to the floor. Where the line meets the floor, tie the line to the spring scale and the scale to the floor. Lock the reel in anti-reverse and crank down the rod to the point where the spring scale reads one half of the pound-test class of line to be fished on the rod. For example, if you are building a 30-pound class rod, the amount of bend in the rod should be whatever is required to produce a scale reading of 15 pounds.

If, with the rod deflected as above, the line is pulled against the foregrip or blank, you will need a higher-frame butt guide. Here again, don't be afraid to mix guide models. It's done all the time by knowledgeable custom builders. On a light rod using AFTCO regular-size roller guides, I've often replaced the #5 butt guide with a #51 heavy-duty butt guide, just to get the extra height.

When you are satisfied that the butt guide is high enough, turn your attention to the spacing of the remaining guides. Leave the rod deflected at the scale reading explained above. Working from the tip back, reposition the guides as necessary to eliminate any flat spots where the line touches the blank. If you cannot accomplish this with the existing number of guides, you will have to add another small guide.

On West Coast stand-up offshore rods it is important that you run a deflection test as described above. These rods are built on some unusual blanks with very light tips (to toss a live anchovy) and very heavy mid-, and butt sections (to fight heavy tuna). When these rods are really flexed, the bend is often low on the rod, with the light tip just parelleling the tight line. Instead of roller guides, boat guides are used. Because of the unusual blank flex profiles, more guides are used than on any comparable rods. The only way to know how many guides and where to locate them is with the rod-deflection test. In fact, custom rod builders who make many of these rods often build a jig to hold the rod and the (spring scale) tie-down.

FORMULAS FOR APPROXIMATE SPACING

As explained in the previous section on guide spacing for each type of rod, it is helpful to some rod builders to have a spacing formula to use for *starting points*. This is for the initial placement of guides *before* the applicable casting tests and stress-distribution tests are performed. In most all cases you can do just as well by placing the guides by eye. Quite frankly, that is what I do 90% of the time—lay the rod on a bench and lay the guides aside of it where they look good to me. It cannot be emphasized too strongly that *the formulas do not determine the final placement of guides*. The tests do that. In some cases where a level-taper blank is used, the formula will be quite close. In others, considerable adjustments will be required as a result of the tests. If you keep a record of the final placement of guides on each rod you build, you will accumulate a data bank that will aid you in determining starting points for similar rods.

The small, compact calculator is becoming a standard item in most households. For those who prefer using a formula, it can be computed very quickly once you are familiar with the formula. Two formulas are listed below. Both require knowing the number of guides to be used. The first also requires a starting point for the butt guide. This can be gleaned from some of the rough rules of thumb given earlier in this chapter. In fact, the second formula incorporates this data in the tables that are part of it.

This first formula is the work of RodCrafter Victor M. Cutter. He first places the butt guide at the previously determined starting point. Then he measures the distance from the butt guide to the tip-top, and plugs that measurement into his formula. The example given is for a 7-foot spinning rod using a total of six guides with the butt guide spaced 32 inches from the butt of the rod.

X	1st guide
$X + 1$	2nd guide
$X + 2$	3rd guide
$X + 3$	4th guide
$X + 4$	5th guide
$X + 5$	6th guide
$6X + 15 = 52$	(distance from tip to butt guide)
$6X = 37$	
$X = 6\frac{1}{6}$	

To determine the *increasing space between* each guide, return to the formula. You now know that $X = 6\frac{1}{6}$ inches. Thus, the distance from the tip to the first guide is X, or $6\frac{1}{6}$ inches. The distance between the first and second guide is X plus 1, or $6\frac{1}{6}$ plus $1 = 7\frac{1}{6}$ inches. The space between the second and third guide will be X plus 2, or $6\frac{1}{6}$ plus $2 = 8\frac{1}{6}$ inches. Continuing with the formula, you will find successive spacings to be: $9\frac{1}{6}$, $10\frac{1}{6}$, and $11\frac{1}{6}$ inches.

Guide	*Formula*	*Space between guides (inches)*	*Space from tip (inches)*
1	X	$6\frac{1}{6}$	$6\frac{1}{6}$
2	$X + 1$	$7\frac{1}{6}$	$13\frac{2}{6}$
3	$X + 2$	$8\frac{1}{6}$	$21\frac{3}{6}$
4	$X + 3$	$9\frac{1}{6}$	$30\frac{4}{6}$
5	$X + 4$	$10\frac{1}{6}$	$40\frac{5}{6}$
6	$X + 5$	$11\frac{1}{6}$	52

The second formula, by RodCrafter Steve Volkers, is really a little system that is designed to be used with an electronic calculator with a constant-multiplier function. You need to know the number of guides, of course, and the distance from the tip to the butt guide. To help you with the latter, see Table I. Note that the space given is from the center of the reel seat to the butt guide. For each category of rod, there is a range of spacing. If your rod is longer or shorter than average, use the longer or shorter distance. If you feel your rod has other factors that will affect the placement of the butt guide, take them into account. For example, on extra-fast- and fast-action blanks, you can put the butt guide farther from the reel than on slow- and moderate-action blanks.

The next step is to determine in Table II the Recommended Factor that applies to the type of rod you are building. In Table III, the Calculation Table, you will find sections headed by the different factors. Using the factor section for your rod, read down to the row labeled with your number of guides. You will find two numbers there: one headed Multiplier and one headed Divisor. You will work first with the Divisor.

The distance, or space, from the tip to the butt guide is divided by the Divisor to give you the space from the tip to the first guide.

You now switch to the Multiplier column. The space between each guide and the next is found by multiplying the space from the tip to the first guide by the Multiplier listed in each row labeled with the number of guides.

Let's look at an example. Suppose we have a seven-foot freshwater spinning rod on which we want to place six guides.

Therefore:

(1) Using Table I, we decide to place the butt guide 27 inches from the center of the reel seat. When placed there on the blank we measure the distance from the butt guide to the tip and find it to be 50 inches.

(2) We refer to Table II and find that the Recommended Factor for a freshwater spinning rod is 1.15.

(3) We move to Table III and select the 1.15 factor section. Reading down the left to six guides, we read across to find the Divisor is 8.75.

(4) We divide 50 inches by 8.75.This equals 5.71 inches, which is the space from the tip to the first guide. We leave this number, 5.71, in the calculator as the constant.

(5) Starting at the top of the Multiplier column, we multiply our just determined space from the tip to the first guide by each respective multiplier:

$$5.71'' \times 1.00 = 5.71''$$
$$5.71'' \times 1.15 = 6.57''$$
$$5.71'' \times 1.32 = 7.54''$$
$$5.71'' \times 1.52 = 8.69''$$
$$5.71'' \times 1.75 = 10.00''$$
$$5.71'' \times 2.01 = 11.49''$$

The numbers in the last column just generated are the spaces between guides. If we prefer spacing for each guide from the tip, all we have to do is add and subtotal:

1. 5.71″
2. 12.28″
3. 19.82″
4. 28.51″
5. 38.51″
6. 50″

TABLE I

BUTT GUIDE SPACING FROM CENTER OF REEL SEAT

Fly Rods	28 to 35″
U/L Spin	18 to 25″

Medium Spin	22 to 28″
Bait Casting	16 to 24″
Boat & Trolling:	
E. Fast (West)	22 to 28″
Mod. (East)	18 to 23″
Surf Rods	25 to 35″

TABLE II

RECOMMENDED FACTORS

Fly	1.05
F/W Spin	1.15
S/W Spin	1.20
Steelhead:	
Spin	1.20
Cast	1.15
Bait Cast	1.20
Boat	1.10
Surf:	
Spin	1.20
Cast	1.15

TABLE III

CALCULATION TABLES

# of Guides	*1.05 Multiplier Divisor*	*1.10 Multiplier Divisor*	*1.15 Multiplier Divisor*	*1.20 Multiplier Divisor*
1	1.00/1.00	1.00/1.00	1.00/1.00	1.00/1.00
2	1.05/2.05	1.10/2.10	1.15/2.15	1.20/2.20
3	1.10/3.15	1.21/3.31	1.32/3.47	1.44/3.64
4	1.16/4.31	1.33/4.64	1.52/4.99	1.73/5.37
5	1.22/5.53	1.46/6.10	1.75/6.74	2.07/7.44
6	1.28/6.81	1.61/7.71	2.01/8.75	2.49/9.93
7	1.34/8.15	1.71/9.48	2.31/11.06	2.99/12.92
8	1.41/9.55	1.95/11.43	2.66/13.72	3.58/16.50
9	1.48/11.03	2.14/13.57	3.06/16.78	4.30/20.80
10	1.55/12.58	2.36/15.93	3.52/20.30	5.16/25.96
11	1.63/14.21	2.59/18.52	4.05/24.35	6.19/32.15
12	1.71/15.92	2.85/21.37	4.65/29.00	7.43/39.58

SPIRAL GUIDE PLACEMENT

There is a type of guide placement for baitcasting rods that always catches other fishermen's eyes and turns a lot of heads. The reel sits on top of these rods, but the guides on the butt end spiral quickly around the rod. The remainder of the guides are under the rod. It is called spiral guide placement by most, or the "Roberts Wrap" by some, crediting Chuck Roberts with the idea. Actually, I understand it was used by some anglers in England before World War II. It was first reported in the *RodCrafters Journal* by Joy Dunlap, and there were subsequent articles by Eric C. Stirrup and Bill Blount. A number of other RodCrafters, such as Fred Stevenson, Jack Justis, and Gil Rowe, have given talks and demonstrations on the concept at RodCrafter Seminars across the country.

Spiral guide placement is not confined to casting rods such as bass rods. It may be applicable to any rod designed for use with a conventional revolving-spool reel. That would include steelhead rods, saltwater popping rods, general boat rods, and deep-water jigging rods to name just a few.

On all these rods, the reel is on top and so, normally, are the guides. A good rod builder takes care to mount the guides on the blank's effective spine to prevent it from twisting when a fish is being fought. Even so, these rods can present a problem because the guides stick straight up, holding and balancing the line directly over the centerline of the rod. When the rod is bent under the weight of a fish and it is moved to the side to fight the fish, the line sometimes "loses its balance." It then falls to one side or the other, twisting the rod in the process. That can't happen with a spinning rod because the line is underneath the rod, adding to its stability. If the guides and line are spiralled around to the underside of a casting rod, then it, too, becomes much more stable.

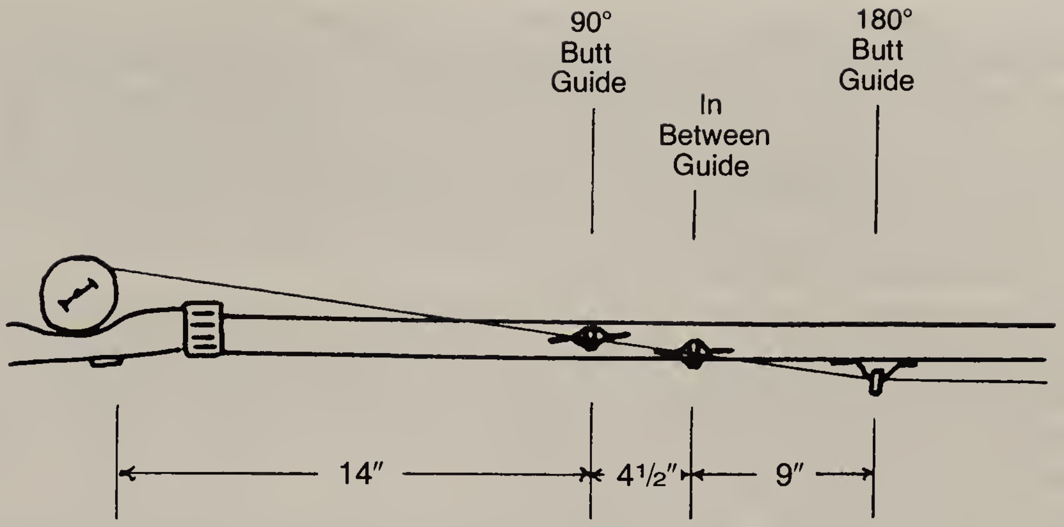
About ten years ago, a unique casting-rod handle was marketed to do the same thing. The blank entered the front of the Z-shaped handle high enough so that the line went out through the guides mounted on the underside of the blank. Fishermen liked the idea of the guides mounted under the rod, but the handle was too big and heavy and was clumsy to use. It never made the grade.

Rods for conventional revolving-spool reels present certain problems if they are flexed into a very tight arc. Since the guides sit on top of the rod, they will be holding the line on the outside of the curve. As the rod is bent more and more, it becomes increasingly difficult to keep the line from touching the blank. You can add more guides, but obviously that starts to present its own set of problems. If the guides carry the line around to the underside of the rod, the problem disappears. No matter how much the rod is flexed, the line will not contact the blank.

RodCrafter Eric C. Stirrup faced the problem initially in building long, ultralight "noodle rods" for steelhead and salmon. These originated in Michigan and were made for closed-face spinning reels mounted, as were the guides, on the underside of the rod. When the principle was picked up by Eric (in Seattle, Washington) he had to build the rod for local revolving-spool casting reels mounted on top of the rod. Using a 10½-foot slow-action blank designed for two- to six-pound line, he tried guide arrangements of (1) all Foulproof guides, (2) all Fuji Flealight guides, and (3) a combination of Fuji single-foots and snake guides. In all cases, a total of 16 guides were required, 12 of which were on the tip section.

During his trials the weight of the guides on the tip seemed excessive. Also, when the rod was bent to a point of maximum flex (as it was designed to do in this kind of fishing) most of the guides were still spaced too far apart, allowing the line to rub against the rod. Even more guides would be required to alleviate this problem. But with 16 guides, as much as two feet of deflection occurred at the tip-top upon completion of the cast. Because revolving-spool reels require a fairly constant pull on the spool, this bouncing back and forth at the tip created a noticeable reduction in the casting distance as well as backlash problems. Needless to say, he was not satisfied with the results.

One of the advantages of spiral guide placement he had read about in the *RodCrafters Journal* was "we need use only as many guides as required for adequate stress distribution." After some experimenting, he finally ended up with a total of only 11 guides. Fuji Flealights (MVSG) were chosen because they were exceptionally light, with increased



Spiral guide placement for the first three guides at the butt end of the rod.

guide-ring height. The combination of spiraling the higher-frame guides and the utilization of fewer guides to distribute the line stress over the inside arc of the bent rod nearly doubled the previously mediocre casting range. By placing the majority of the guides on the underside of the blank, the problem of "flat spots" was alleviated. With fewer guides, the rod was also more sensitive and did not deflect at the end of each cast to the extremes previously mentioned.

Now that we have familiarized ourselves with some of the reasons for spiral guide placement, let's get more specific about how the guides are placed. We'll start with a typical bass casting rod and concentrate our attention on the three guides at the butt end.

The butt guide is placed 13 to 14 inches from the center of the reel. It is *not* aligned with the centerline of the reel foot but instead is placed 90° around the blank. The second guide is 4 to 4½ inches ahead and further rotated. Its exact orientation around the blank is determined after the third guide is positioned. The third guide is a full 180° around the blank (on the underside) and seven to nine inches beyond the second guide. After the third guide is secured, pass a line from the reel through the first (butt) guide, the unanchored second guide, and the third guide. With the line taut, adjust the second guide around the blank so that the line passes through its center. The balance of the guides are located along the underside of the rod following the usual procedures for guide spacing.

Rod builders seem to be divided about the direction in which the guides should spiral, to the right or to the left. It is suggested that casting and retrieving be tried with the guides taped in both positions so that you can reach your own conclusion.

RodCrafter Bill Blount has built a wide range of rods from 30-pound to ultralight using spiraled guides. He uses Fuji tri-leg (SVSG or SVLG) guides for both the 90° and 180° butt guides. The size of the 90° butt guide depends on the size of the line that will be used. If the line is eight-pound or less he uses a size 16. If 10- to 20-pound line, his choice is a size 20. If over 25-pound test, he chooses a size 25 guide. Having established the size of the 90° butt guide, he uses a guide two sizes smaller for the 180° butt guide.

The in-between guide is dependent on the action of the blank. If it is very slow, flexing down into the butt area where the guides are spiralled, Bill uses the same tri-leg guide as for the butt guides. If the blank has a faster action, not flexing into the butt, he prefers a single-foot (LVSG or LVLG) guide. The size of this in-between guide varies with the pound test of the line. If over 15-pound line, he uses the same guide size as for the 180° butt guide. When the line is 15-pound or less, he prefers a guide one size smaller than the 180° butt guide.

The above specifications are not meant to be absolutes which every rod builder should necessarily follow. They are merely guidelines to give you a base from which to run your own tests. I would make one strong suggestion if you are building a fairly heavy saltwater rod. Place the butt guide in the normal position, aligned with the center line of the reel foot. This will prevent line from piling up on one side of the reel when bringing a fish in. You can start the spiralling of the guides with the next guide up the rod—just reduce the spacing from the butt guide to it.

One of the concerns some rod builders have before trying spiral placement is the loss of casting distance due to extra line friction. Most are surprised to find how small the loss is. If you recall our discussion of guide spacing for spinning rods, it was pointed out that friction will not cause nearly the loss that line slap causes. If care is taken in setting up the spiral placement, there will be no line slap.

Also, keep in mind that modern hard ceramic guides are diamond-polished to an incredible smoothness and have exceptionally low coefficients of friction. The line really slips through them. Another point to keep in mind is that, by and large, the rods on which spiral placement is applicable are not rods where casting distance is the most important function. For example, bass casting rods are noted for their accuracy and their ability to control a fish rather than for casting distance. The ultralong, ultralight steelhead noodle rod is first and foremost a gigantic shock absorber permitting the use of two- to six-pound test line. How well it is expected to cast can be judged from the often-heard comment, "All it has to do is hit the river." On either of these rods, a slight distance reduction is of no great concern. And with a "grouper-digger" bottom-fishing rod, there is no casting distance to start with.

Spiral guide placement is not for every rod, but it is a tool that should be in every custom rod builder's kit.

TYPES OF GUIDES

There are many different ring materials, frame styles, and guide types. To the uninitiated, it can be quite confusing, yet the selection of the proper guides is a very important one.

Today, ceramic-ring guides have become by far the most popular type for quality rods. Ceramic rings are so important and so well established that we even have a choice of different ceramic materials. Such was not always the case, and it will help the rod builder get a perspective on guides if he is familiar with their evolution.

Let's go back in time to agate as a material for guides. This semiprecious kind of chalcedony is extremely hard, can be polished to a smooth surface, and will not be grooved by fishing line. As such, it seemed to be ideal for guide rings and was encased in metal frames. It was excellent in all respects except one: It was too brittle and fragile. If the guide received a good rap, the agate ring fractured and became useless. Guide makers turned to metal and finally rings of stainless steel.

Tungsten carbide was the next material tried. It greatly resisted grooving by monofilament lines. However, its very name, *tung sten* meaning "heavy stone," is a clue to its biggest drawback. The heavy weight slowed the action of the blank. This prohibited its use on ultralight rods. Over a period of time the compressed tungsten-carbide surface also tended to erode, causing it to become microscopically rough and abrasive to lines. The composition ring had to be soldered to the metal frame, and in time the joint often became brittle and broke, especially when the rod was used in saltwater.

Very hard, so-called industrial, chrome plating was found to resist grooving almost as well as tungsten carbide. Guide rings so made had the decided advantage of being much lighter in weight. The radius of the ring itself (when viewed as a cross-sectional cut of the ring) could be made smaller than for tungsten-carbide rings. This presented less surface to the line, thereby reducing line friction as it passed through the guides. Industrial chrome plating was more expensive and not necessarily recognized by rod buyers. This led some companies to use less expensive and less hard types of plating, which naturally did not wear as well.

The earliest ceramic guides were an attempt to duplicate or produce a substitute for agate. They amounted to little more than glass and were fragile and heavy. Their period of popularity was very short as a result. The first successful ceramic was white porcelain, introduced by Fuji Kogyo Co., Ltd., of Japan. What was so ingenious about this guide was the fact that the ceramic was encased in a plastic shock-absorbing ring. For the first time it was practical to make a ceramic rod guide. This guide is still occasionally seen on some economy-class rods.

With the way now open, Fuji sought and found a harder ceramic material, aluminum oxide. It was over twice as hard as the earlier porcelain—so hard, in fact, that you could not wear it out with a file, and diamonds were needed to polish the surface smooth. Encased in plastic shock rings and mounted in very high-quality interlocking, stamped stainless-steel frames, this guide was years ahead of its time. It took the entire tackle world by storm and is widely accepted as the most popular guide today.

The look of Fuji's aluminum oxide guides was distinctive and easily recognized, and quality-conscious fishermen wanted rods equipped with the new guides. The demand was intense. Surprisingly, American guide manufacturers did not develop their own ceramics or do any serious research. Instead, they wrongly assumed the new guides were a fad and would soon fade from the scene. It was only after sales kept plummeting and American rod manufacturers (who could not get fast enough delivery from Fuji) kept requesting ceramics, that the Americans entered the market. Rather than retool to make the lighter and higher stamped frames, these manufacturers used their existing wire frames. The shock and aluminum oxide rings were press-fit into these older, lower, heavier frames.

Keep in mind that this was the time when the new graphite rods and blanks were all the rage. Both graphite and glass blanks were being redesigned and engineered to be lighter, more responsive, and much more performance-oriented. Like the big automobile engines of the '60s that were being replaced, blanks could no longer loaf along and perform at 50% of their capacity. The amount of material was reduced, the fat was taken out, and the leaner but better blanks worked at 80% minimum.

In most cases, the American guides were too heavy for the newer blanks. The guide companies could see the need but failed to respond. Fuji during the same period introduced lighter, more applicable single-foot guides and conducted research to enable them to make even lighter guides not requiring shock rings.

One by one, the American guide manufacturers went out of business or stopped making ceramic guides entirely. From what I've been told, and what I've seen, it should never have happened. It wasn't a case of someone in the Orient making a poorer product or a shoddy imitation that sold for less. Fuji was the innovator who was obsessed with quality and invested heavily in original research.

Fuji next developed a slightly harder "N" ring, made of silicon nitride ceramic that could be polished to an excellent smooth surface. Made into a heavier ring and combined with a thin shock ring, it was better able to withstand severe shocks. Its use was mainly for boat rods.

Fuji had for some time made exceptionally hard (and exceptionally expensive) rings of industrial sapphire and industrial ruby. These were obviously for use on special presentation rods. Finally, after much intensive research, the company was able to come up with a super-hard ring—even a bit harder than the exotic jewel rings.

FUJI GUIDE RINGS

	Symbol & Name	Vickers Hardness	Specific Gravity	Thermal Conductivity	Shock-Ring Construction
C	Porcelain	550-650	2.7	0.02	Shock ring
H	Aluminum Oxide	1200-1400	3.6-3.9	0.04	Shock ring
L	Hardloy	1200-1400	3.3	0.02	Shock ring
N	Silicon Nitride	1300-1500	3.8	0.04	no
S	Silicon Carbide (SiC)	2200-2400	3.1	0.17	no
	Sapphire	2000-2200	4.0	0.08	—
	Ruby	2000-2200	4.0	0.08	—

Designated SiC, the rings are made of silicon carbide. This material is 12 times harder than stainless steel and almost twice as hard as aluminum oxide. Incredibly smooth, it is a graphite-black color and eliminates friction better than any other ring. It also is less fragile and does not need a shock ring. It therefore is lighter and less air-resistant.

Perhaps the most outstanding attribute of SiC is its great heat-dissipating ability. When a big fish makes a hard run, it's the heat build-up at the point of line contact on the guide that causes line wear, then line failure, and the loss of the fish. The SiC ring conducts heat away from the point of contact. The lack of a shock ring helps even more in dissipating heat. In fact, the frames of Fuji's heavy-duty boat and trolling guides are made of brass to assist in this dissipation of heat.

Within another year, Fuji developed a higher-grade aluminum oxide ring, designated "L" and called Hardloy. The big advantage of this material was that it was much more shock-resistant and stronger than regular aluminum oxide. It therefore could be mounted directly in the metal frame without a shock ring. With two ceramics requiring no shock rings, Fuji developed a whole new frame design into which either could be mounted.

The new slim-profile frames are every bit as significant an improvement as are the ceramics. The two braces to the side of the ring from a concave V while the center brace forms the other foot. Hence the name "tri-leg." Even the regular, general-purpose models are higher than the older BSHG and BSPHG models. Fuji has also added new very high-frame, small-ring models for ultralight rods in both tri-leg and single-foot designs. The strong one-piece frames contain no welds and are lighter in weight. They are also more flexible than the older frames. The length from the leading edge of one guide foot to the leading edge of the other guide foot is reduced.

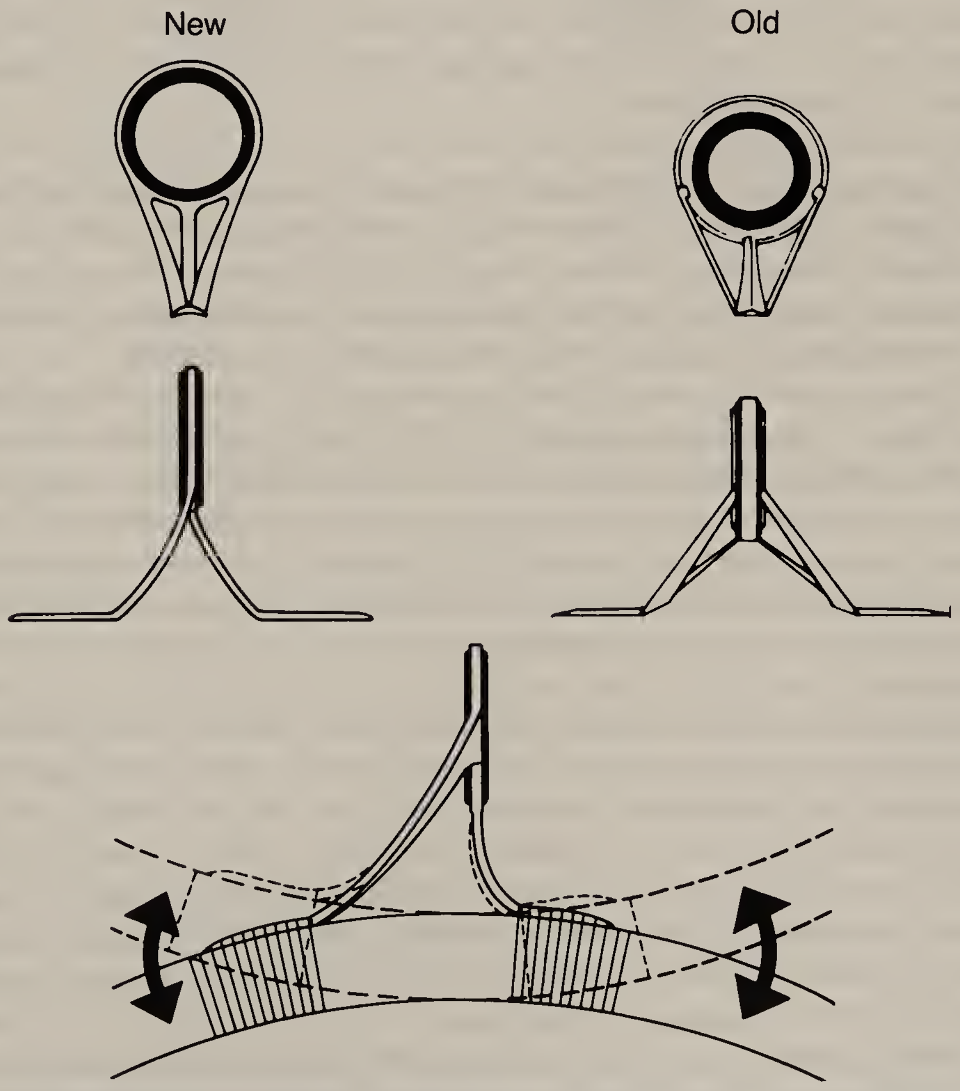
Before we get into some of the specific guide models and their application, we need to examine the general improvements afforded by these new frames. By way of background, in the original edition of this book I identified what I believed to be the most important specifications for evaluating and comparing guide performance. These were weight, height, ring I.D., and combined feet span. I personally weighed and measured all the well-known guides of the time and presented the specifications in tabular form. You'll find that updated data at the end of this chapter. The new guides have been added and some others deleted. Interestingly, the ones that have dropped out of the picture over the last nine years are the ones that by and large were rated worst by their specifications. Others still there but with poor ratings have sales so low that it is only a matter of time until they disappear. I bring all of this up so that you can have some confidence in the criteria by which we are judging guides. If you understand generally what makes a quality guide, then all you have to do is select the proper model for your rod.

The new Fuji frames sit higher. By height I mean the distance from the blank to the inside of the bottom of the guide ring. As we discussed under guide spacing, it is the height that keeps the line from slapping against the blank and reducing casting distance on *all* types of rods. It's easier to work out guide spacing with higher guides.

If you look at the new Fuji frames you will find the area around the guide ring is remarkably free of any bracing. On many other guides, the bracing attaches high up on the sides of the ring. From there it angles way out to the foot of the guide and is often very close to the flight of the line through the ring. We know that the guide must choke the coils of line and reduce their diameter. In the process, line usually piles up at the front of the guide and often slaps against the guide frame. This is just about impossible with the new Fuji frames.

The guides are significantly lighter in weight. The newest graphite blanks are designed to utilize a very high percentage of the fiber's potential. Remember we said that the best blanks are made with the least resin compared to fiber. If it is important to eliminate nonproductive dead weight in the form of excess resin, then it is just as important to eliminate every grain of excess guide weight. If we do, the rod will be more responsive and sensitive. (For those who can afford it, Fuji even offers the same frames in lightweight titanium.)

It's not easy to make a guide more flexible and at the same time make it stronger, but Fuji did it. The new frames do not have all the rigid bracing of the old BSHG or the heavy arched frame of the BNHG. They are made of a special spring stainless steel. This



Among other things, the new Fuji frames on the left are far more streamlined and have less air resistance. They are also more flexible (bottom) and stronger.

combination allows the guide frame to flex with the blank. In this way, any given blank can deliver more of its high-performance potential. An ancillary advantage, especially to custom builders, is the fact that since the guide frames flex more, there is less cracking and checking of the wrapping finish at the ends of the guide feet. (We'll discuss this more in the chapter on finishing.)

In the chapter on blanks we saw how certain characteristics of guides can make a blank stiffer. One of these is the combined feet length, or the distance from the end of one guide foot to the end of the other guide foot on a tri-leg or two-foot guide. The longer this splint-like effect is, the more the guide will stiffen the blank. I felt this important enough to list it as one of the criteria by which we can compare guides. On the tables it is simply called "Feet." The new Fuji guide frames are substantially shorter in this measurement than the older BSHG. As a result, the new guides will be less restrictive to the action of the blank.

Even the slim profile of these guides is an advantage. They produce considerably less air resistance during the cast, making it easier to generate higher tip speeds. It is the speed at which the rod tip is moving when the line is released that determines how far the lure will travel. The higher the tip speed, the longer the cast will be. If you doubt the effect of air resistance have someone drive a car at about 35 miles an hour while you stick a rod fully out of the window at a right angle to your path of travel. You'll be amazed! The slim frame profile also allows packing rods or rod sections together in less space and with less chance of damage.

Each of these characteristics of the Fuji frames is an advantage in and of itself. When we combine their effects on any given rod, the blank is going to be more responsive and perform better than it would with other guides. The Fuji frames are so unique they have been granted a number of patents.

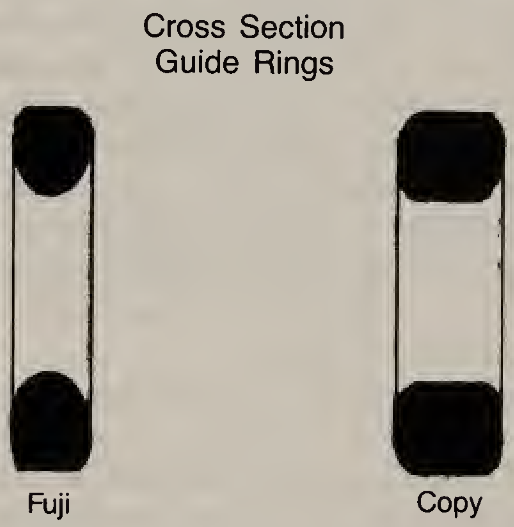
In the first edition of this book I presented what was for that time a huge amount of information and specifications on guides. I'm sure some people's reaction was, "Why all the fuss? A guide is a guide." Others studied a little deeper and found—as I and many other rod builders have found—there are a lot of differences between guides. Today's high-performance blanks need the very finest guides to achieve their full potential. I've explained the significant criteria so that you can judge for yourself.

I feel I must sound a warning about the look-alike cheap imitaitons being made in Korea and Taiwan. These are copies of the Fuji BSHG and BSPHG frames in all the finishes, even down to the black frame with the luminous green shock rings. They are also making copies of the Fuji saltwater boat guides, models USG and UNG. They cannot legally make copies of the new patented Fuji frames. Their own attempt at a different frame design was a take-off from a very short-lived European design that resembles a large snake guide with a ring suspended from the center. The ring sits much too low and is poorly supported.

The materials used in these cheap imitations may look the same, but they are most often not of the same quality, despite advertising claims. What I find quite disturbing is that the materials are inconsistent from one production run to another. This is almost a trademark of some of the low-end products in the tackle industry—they use whatever raw material is a good buy at the time. For example, there are all kinds of stainless-steel alloys. Some are stronger, some less brittle, some with better corrosion resistance, etc. One batch of guides we tested corroded quickly in saltwater. Another time the frames broke easily when they received a sharp rap.

The same problems exist with ring materials. There are all kinds of ceramics that someone could choose to call "aluminum oxide." Some of the manufacturers came up with a name that looks like or sounds like a well known name. Others advertise trade-marked material but in practice use something else 95% of the time. In our tests we've found ceramic rings that were easily grooved by monofilament and others that cracked easily.

Another ring difference is often identified by simply holding a cheap imitation next to a Fuji guide. The inside of the Fuji ring is made and polished to much more of a radius. The imitation ring will be thicker and more or less flat around the inside. This presents a great deal more surface for the line to rub against and it produces many times more friction for a decrease in casting distance and an increase in line wear. Also, when we measured the inside diameter of the ceramic rings we found that just about all of the cheap imitations were smaller for a stated size than the Fuji rings.



The inside of a Fuji ring has more of a radius than the cheaper imitations.

The finishing in general was not up to par with Fuji, and was quite inconsistent. We have seen both black and gold frame platings that came loose in spots like the brown inside shell on a peanut. Another group of guides had burrs on some of the shock rings.

Even if these cheap imitations were every bit as good in quality and specifications as the old BSHG and BSPHG—which they certainly are not—they would still be "second best" guides compared to the new patented-frame Fuji guides.

Now, despite our findings regarding the imitation guides, I'm sure (or at least I hope) that some of these companies will in the future set out to manufacture a high-quality guide. Unfortunately, the easiest and fastest way to get into the tackle business has been to compromise quality and make it cheaper.

Throughout this book and everything I've ever written about rod building, I have emphasized that our biggest investment is our time and skill. Our objective is to realize some enjoyment while making a better rod, and that means using the best components. So for the life of me, I can't see why anyone would want to save a few bucks on anything as important as a set of guides.

GUIDE SPECIFICATIONS AND APPLICATIONS

When we covered guide spacing we necessarily discussed some factors that affect rod performance. Other performance factors were explored in connection with modifying the action of a blank in the chapter on the blank. In the preceding section, we touched upon still more information relating to performance. It remains now to tie all of this together, along with related facts, so that we can select the right guides for any rod we build.

As an aid in evaluating guides for different purposes, I have prepared tables showing a number of important specifications. These appear at the end of the chapter. There have been various changes in the nine years since the first edition of this book and all of the specifications have been updated. I weighed and measured each guide myself. The guides were selected at random, so they may vary from the norms. The weight shown is in grains and was obtained by using an Ohaus Triple Beam Loading Scale, Model 314. The other measurements are in millimeters. Where applicable I used a Max-Cal Electronic Digital Caliper. I was careful to be as accurate as possible, but when making hundreds of separate measurements there are bound to be some errors, for which I accept full responsibility.

I have tried to list the guides used most by rod builders. Some, such as the Perfection Wire WCSL (wire ring and frame), are used very seldom on new rods but are utilized often for repairs. I felt they were needed for comparative purposes. The Foulproof guides are being used less for various reasons, but the data for them complete the picture. I have not listed the cheap imitations made in Korea and Taiwan because for comparative purposes you can use the tables on the genuine Fuji BSHG and BSPHG guides.

Actually, the BSPHG guide is no longer made by Fuji and I would expect that the older BSHG will be phased out. However, it will be better to use the specifications of these originals than to list inferior imitations.

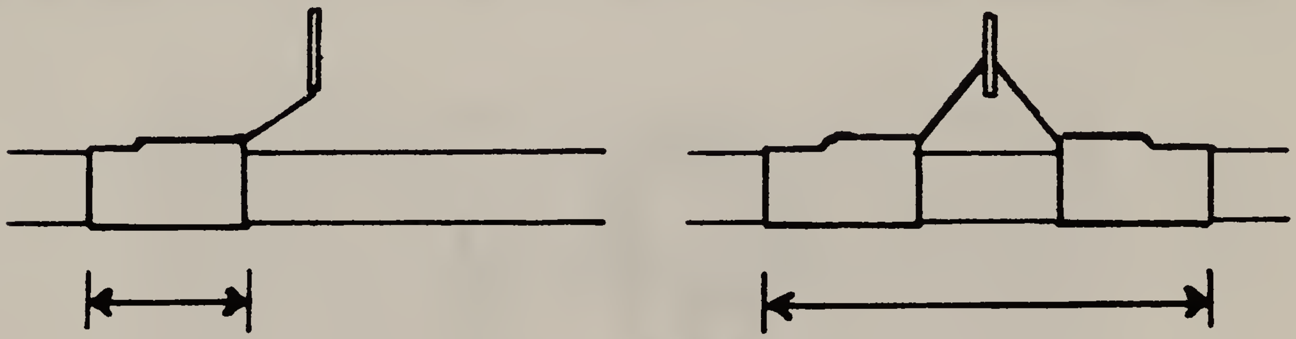
Let me review each of the four listed specifications. *Weight* is given in grains. *I.D.*, in millimeters, is the inside diameter of the guide ring. *Height* is especially important, as discussed previously; it is the height in millimeters from the blank to the bottom inside of the guide ring. *Feet*, in millimeters, is the distance measured from the leading edge of one guide foot to the leading edge of the other guide foot in the case of two-foot or tri-leg guides, and includes the space beneath the guide ring. On one-foot guides, the measurement is simply the length of the foot. This specification is given as one indication of the resistance to flexing that the guide feet impart to the blank.

As noted earlier, the guide feet can be ground shorter if there is still enough surface for support, and if it is desired. The Fuji tri-leg guides, made from spring stainless steel, are slightly less restrictive. On Foulproof guides the space between the guide feet is longer. For example, on the SP-7/8, the total length is 80mm but each guide foot is only 20mm long. In addition, the Foulproof guide is designed of one continuous piece of monel wire with the guide ring resembling a coil. This permits the guide to flex more freely than other types of two-foot guides, reducing the resistance imparted to the blank.

The tables should not be considered absolute facts. They are meant to be used as relative figures for comparison. When employed in this manner they can serve you well. Since the height of a guide (to the bottom inside of the ring) is one of the most important specifications, I have it for all guides (except Perfection Wire) on one table titled General Height comparison. This should be helpful not only for selecting which model to use for a given rod, but also for continuing a height progression when using different models on one rod. Weight is another important specification on lighter rods, and I have listed typical guide sets for three different spinning rods. The analytical rod builder will realize that the distribution of weight in a given set of guides can be important. When comparing two guide sets of approximately the same weight, the one with a greater percentage of the weight at the tip end will have more of an adverse effect upon rod action than one with a comparatively high percentage of weight at the butt end. For this reason I listed the weights of the various tip-tops on a table titled Weight Comparison, Tip-Tops. I would suggest you refer to these tables as we turn our discussion to guide types and applications.

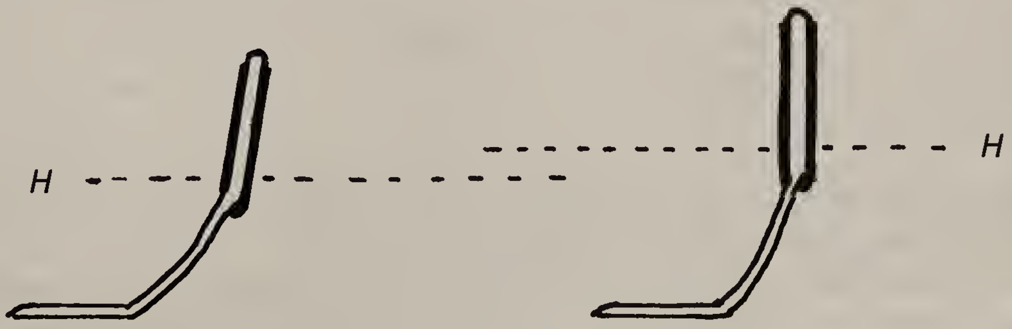
The one-foot guide is one of the most versatile guides ever designed. It is used mostly on light and ultralight spinning rods. However, I've seen it employed very effectively on double-built surf-rod blanks made for sturgeon fishing as well as the tip sections of bass casting rods. The appeal of the single foot is primarily less weight and less restrictiveness. For example, on the table titled General Weight Comparison, if one-foot LVSG or LVLG guides were used for the first rod (six- to seven-foot medium light rod) the weight for the six guides and tip-top would total 214.6 grains. That's a saving of 55.3 grains over the identical tri-leg guides. There is a hidden weight advantage also. You use only about one third to one half the amount of wrapping finish (depending upon whether you coat the area between the two guide feet). This can be substantial. On one test rod using two-foot guides, the high-build polymer finish weighed 115 grains. On a similar rod with a light finish (Crystal Coat), the finish weighed 35 grains. So, compared to the high-build finish, you could save another 38 to 58 grains.

While the weight saving is significant, I feel that the blank's freedom to flex more naturally is more important. If you compare the "Feet" specifications for a size 20 one-foot LVSG with a tri-leg SVSG you have 16mm versus 41mm. The splint effect of the guide foot and the thread wrap is over 2½ times as great on the tri-leg guide. If the same comparison is made on the older BSPHG versus BSHG (or the cheap imitations) the figures are 16mm versus 54mm, or over three times as restrictive.



The one-foot guide is considerably less restrictive than a two-foot guide.

We have been saying that the height (blank to bottom inside ring) is more important than the diameter of the guide ring. One of the advantages of the one-foot guide is that you can bend it to increase the height. With light line I have on occasion bent a size 20 (height 16.4mm) to be close to the height of a size 25 (height 19.3mm). Sometimes bending a few guides slightly higher will enable the rod builder to use one less guide or will simplify guide placement. To bend a single-foot guide, place it, foot down, on a benchtop and firmly press down on it with your left thumb. Use your right hand to carefully bend the stem up. It may also be desirable to bend the brace at the ring for vertical alignment of the ring.

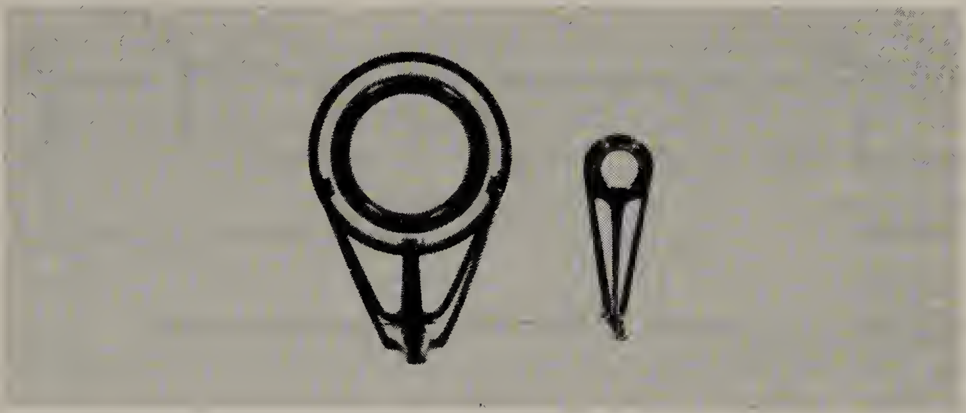


The height of a one-foot guide can be increased slightly by bending.

Some people have the mistaken belief that single-foot guides are more fragile since they have less bracing. All Fuji one-foot guides are made of a special spring stainless steel and actually will survive a sharp bump as well as a braced two-foot guide. (The cheap imitations are usually not spring steel and are more likely to bend or break. This was the reasoning behind the use of large single-foot guides on sturgeon rods built on extra-heavy-walled surf blanks. These rods are used in Oregon and Washington for fishing from the bank into the big pools below the dams. The banks are all rocks and rip-rap, into which the butts of the rods are jammed and onto which they inevitably fall or get knocked—very rough on tackle. Some creative local rod builders found that the single-foot guides "gave" under impact rather than becoming dented or broken.

With all these advantages it is easy to see why this type of guide is used so much. Because it is less restrictive and weighs less, the one-foot guide is excellent to use on the tip portion of any rod with a lighter, faster tip. The heavier tri-leg guides can be used on the butt section. The transition can be made wherever the rod builder feels it appropriate to achieve the action desired. I've a great many spinning, casting, and other rods made with this practical guide combination.

Flealight guides are special, very light, very high-frame models. The ceramic ring sizes run from a tiny 4.5 to a 20, but sit exceptionally high off the blank. They are the answer to an ultralight spin fisherman's prayer. For example, if the line to be used on the rod is in the two- to six-pound range (not over six-pound test) a size 16 is more than big enough for the butt guide. I've built quite a few Apogee Graphite "Fleaflicker" ultralight spinning rods for four-pound test and under, using a size 10 for the butt guide. This is possible because of the height. If you check the tables of specifications and compare the height, in millimeters, here is what you will find:



A Fuji Flealight MVSG size 5 (right) sits higher than the old BSHG size 16.

	MVSG/HLV		*LVSG*	*BSPHG*
Size 16	26.8	Size 20	16.4	13.8
Size 12	22.3			
Size 10	17.9			

That means the size 10 Flealight is 1.5mm higher than a size 20 LVSG. (It's a whopping 4.1mm higher than an imitation single-foot.)

You'll remember from our discussion of guide placement that a small ring can be used to choke down unfurling line and bring it under control if (1) the guide is high enough, and (2) the line is light enough in pound test and limp enough. With two- or four-pound test line we can use the size 10. If you want to feel more assured and have a bit of an easier job placing the butt guide, you can move up to a size 12 with a height of 22.3mm. With that set-up and the size 12, you can also use six-pound limp mono.

My personal feeling is that for a *butt guide* the largest Flealight of size 20 is good for up to eight-pound test line as long as the line is not the hard nylon type of monofilament. In some situations with definitely limp mono you might be able to push it to 10-pound test.To do so you would have to be casting a lure at the upper end of the rod's lure-weight range. For example, if the blank was rated for 1/8 to 3/8 ounces, you would need the 3/8-ounce lure to get good distance. We're definitely out of the ultralight category here and into light saltwater, but it gives you a working example of some of the factors affecting guide selection.

Let's return to the ultralight, say a five-foot Apogee Graphite Fleaflicker blank rated for a true 1/32 to 1/8 ounce with two- to four-pound line. Using the one-foot HLV guides, we would need the following sizes: 10-7-5-4.5. If you total the weights of those guides plus an MVLT tip-top, you get 31.4 grains. The rod will perform beautifully, being responsive and extremely sensitive. If on the same blank you used single-foot LVSG/LVLG guides you would have more than twice the weight; or if imitation BSPHG guides, more than three times the weight. The blank would become quite slow in action and very sluggish in the way it responded. Heavier guides would also rob the finished rod of some of the blank's superb inherent sensitivity. Using the high-frame HLV guides and a cork grip with sliding rings, you should be able to keep the finished rod weight under one ounce.

Guides for fly rods were traditionally snake guides, small pieces of light wire bent to form a U relative to the blank, then pulled apart to create two feet for wrapping. The butt or stripping guide was a ring guide made, many years ago, of agate, then wire, tungsten carbide, and today most often ceramic. The tip-top was initially a pear-shaped loop of wire attached inside the same tube that was glued over the tip of the blank. Today, more tip-tops are of lightweight ceramics.

To a certain group of fly fishermen, a fly rod should always be equipped with snake guides. These are people who have a great love of the rich tradition so strongly associated with the gentle art of fishing with the fly. There is another group not so steeped in classic fly-fishing lore, but convinced that fly rods should have snake guides because, well, that's the kind of guide you always see on a fly rod.

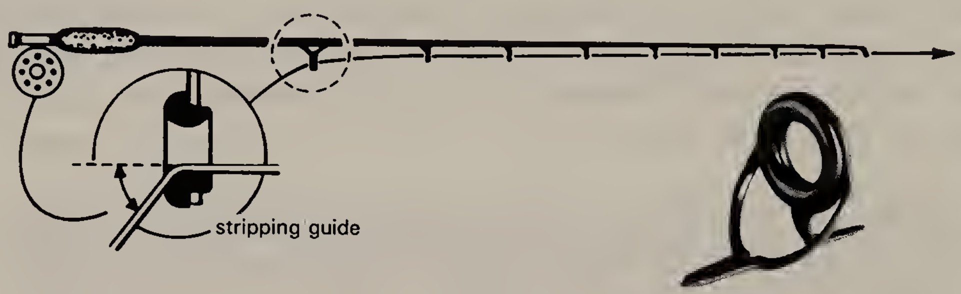
Perhaps I've mellowed. Even though I think single-foot ceramic ring guides are better, I strongly believe the fishermen in those two groups should fish rods with snake guides. When I build a fly rod for someone, the subject of guides is always discussed. If he has strong feelings about snake guides then that's the way the rod will be built. If he's not so adamant, I'll share my thoughts on both guides (while subconsciously pushing ceramics.) After that, if he is at all hesitant or if I feel he is leaning in the direction of the snakes, then the rod will have snake guides.

You might feel that I am compromising my beliefs. I disagree. What is far more important here is that the person fishing the rod firmly believes it is a great rod or at the very least a really good rod. If he does, all kinds of wonderful things will happen. He'll take pleasure in each cast. He'll have confidence that the rod can do certain things better, and since confidence is often half the battle, he and the rod *will* do those things. He will be more attentive to his fishing—good presentations, less drag—and will be more alert to the flash or strike of a fish. The chance of that happening is pretty remote if he's a die-hard traditionalist whom I temporarily talked into ceramic guides.

I do believe O-shaped ring guides do a better job of keeping the fly line away from the blank. The basic U configuration of snake guides tends to hold the line against the blank. This should be cause for concern since the fly line is large (compared to mono) and the rod is long—both of which contribute to distance-robbing friction and slap.

Ceramic guides are not the first ring guides to be used on fly rods. Over the years, lightweight wire guides have been employed and advocated by various mavericks. In the half-dozen years before Fuji guides appeared, quite a few custom rod builders used very light wire Foulproof guides on fly rods. Even some of the fly-fishing authors of the time encouraged their use. The circular rings did help hold the line away from the blank and enabled most casters to gain distance on the shoot of the line. Unfortunately, those guides were quite fragile and bent easily when bumped. Like snake guides, they also wore out when subjected to heavy fishing use and then, unless detected in time, ruined the fly line.

Despite the fact that the O-shaped rings did cast better, many of the rod builders' customers refused to try them because "they didn't look right." About that time the rod designer for one of the most respected rod companies (and quite a fly caster himself) confided to me that his company believed circular ring guides performed better on its fly rods, but could not risk trying to market rods that were so unconventional.



The only specially designed fly-rod stripping guide is the Fuji "F" with a flanged ring.

When Fuji introduced the single-foot aluminum oxide fly guides, the public was more willing to defy tradition because of all the good things they had heard about that company's ceramic guides in other applications. They have fared very well. Today, more custom fly rods are built with single-foot ceramic guides than with snake guides, and even a few rod companies use them on special models.

For me, the single-foot SiC or Hardloy fly guides are the best. The perfect circle ring holds the line away from the blank but the guide is not at all fragile like the Foulproof. Very importantly, the ceramics never wear out or groove. Their smooth, diamond-polished surfaces provide the least wear to our expensive fly lines. I've never known of a fly line being ruined by ceramic guides but it happens frequently from snake guides that the angler didn't know had grooved.

If you check the table of weight comparisons for fly-guide sets, you'll find the new ceramics are a hair lighter than a snake set, but for all practical purposes the weight is the same. One of the biggest advantages of the Fuji guides is the single-foot feature. As we have seen, a one-foot guide is less restrictive than a two-foot guide. The rod is stiffened by the splint effect of the metal feet and by the thread wrap and finish matrix which act just the same as increasing the thickness of the blank wall at that point. The two-footed snake guide, spanning a longer area, is about three times as restrictive as the single-foot guide. Also, since it has twice as much thread wrap, it needs at least twice as much finish. I do not advocate high-build polymer finishes for fly rods but most rod companies and many rod builders use them. When used with snake guides the *extra finish* will weigh more than a set of one-foot guides and tip-top.

I have heard some people say they feel the ceramic guide imparts more friction to the line, primarily because of static electricity. If someone is doing some practice or demonstration casting on the the lawn, a *dry* fly line may build up some static charge, especially if they do a lot of prolonged false casting. It is conceivable that such a static charge could cause the line to be attracted to the rod. In any event, the situation will not happen when fishing because the line will be wet. If any static somehow built up, it would be grounded away as soon as the line touched the water. If static electricity were a problem it would show some degree of adverse action on spinning and casting rods using ceramic guides. Instead, I think the problem is dirt.

Fly lines are constantly picking up dirt while they are being fished. All types of lines accumulate dirt in the form of microscopic grit and silica. Dirt is what grooves non-ceramic guides. Since fly lines are are so big in diameter, they collect more dirt. That is why fly fishermen are constantly admonished to clean their lines frequently. Just wiping the line by passing it through a folded cloth at day's end will work wonders. Then, once in a while, use a little mild detergent and water. If you want the line to really shoot through the guides and add distance, use a modern line polish like Shoot-Eze—the kind you put on, wipe off, and let dry overnight before fishing. *Not* the greasy lubricants. They just attract more dirt and you're worse off than when you started!

Where dirt enters into the guide picture is that it cuts down on casting distance. A clean line will shoot better and farther through O-shaped ceramic guides than it will through snake guides. If the line is dirty, it will not shoot very well through either type of guide but it will hang up less on the snake guides. If we go back to the practice or demonstration caster on the lawn, his problem will show up quickly, not because of static electricity but because his fly line gets much dirtier from the lawn than it would from water.

In fairness to both kinds of guides (and to fly fishermen), if a person will not keep his fly line clean, he will be better off with snake guides. He will, however, find that his guides groove and his lines wear out. A person who cleans his fly line will do better in casting (and in line wear) with Fuji ceramics.

Some suggestions to those anglers who, for whatever the reason, prefer snake guides: Use only industrial hard-chrome-plated snakes. They are many times better and will last many times longer than plain stainless-steel snake guides. Also, use large snakes. I can't give you size numbers since no standard designations were ever agreed upon by manufacturers. The larger sizes may look a bit unorthodox, especially at the tip end of the rod, but you will cast farther.

I would make one final suggestion, regardless of the type of running guides you prefer. Use a large stripping guide. If your strippers are about one size larger than those on everyone else's rod, you're on the right track.

Guides for saltwater boat and trolling rods. The undisputed best guides for big-game fishing are well-maintained roller guides. When a fish strips line from the reel, the rollers move beneath it, thereby avoiding friction, heat, and line wear. Unfortunately, a great-many fishermen and boat owners do not maintain the guides properly by washing them thoroughly in freshwater at the end of each day's use and periodically disassembling and cleaning them. Without this care, rollers will not roll. The line then runs across what amounts to a fixed guide of stainless steel, and line failure may result.

In some cases all that is required is education by us, the rod builders, and people will keep their roller guides in top condition. Other individuals are simply not so inclined. If we know the rod owner will not properly maintain his roller guides, we would be doing him a service by recommending other guides.

If we have decided against rollers because of the above, but the rod will be used for fast-running fish such as wahoo and billfish, and/or for hard-running fish such as shark, our problem is heat dissipation. The materials used for the guide ring and frame must conduct the heat away from the point of contact with the line. If they don't, and most materials do not, then the friction of the line builds heat which wears out the line rather quickly. If the line is monofilament, a certain amount of irregular fraying occurs, but basically the mono melts. As it heats up, it elongates, reducing in diameter until finally it is too weak to bear the load and it breaks.

We are looking for a material that has excellent thermal conductivity, but for the guide ring it also must be exceptionally hard so that it can be polished smooth to reduce friction and resist wear. The following table lists these properties for various materials.

Material	*Vickers Hardness*	*Thermal Conductivity*	*Corrosion Resistance*
Diamond	6,000	0.33	Excellent
Fuji SiC	2,400	0.17	Excellent
Silicon Nitride	1,600	0.02	Excellent
Aluminum Oxide	1,500	0.04	Excellent
Tungsten Carbide	1,500-1,700	0.04-0.2	Fair
Hard Chrome	800-1,000	0.06	Fair
Glass	550	0.03	Good
Stainless Steel	under 200	0.04	Fair
Brass	78	0.27	Poor

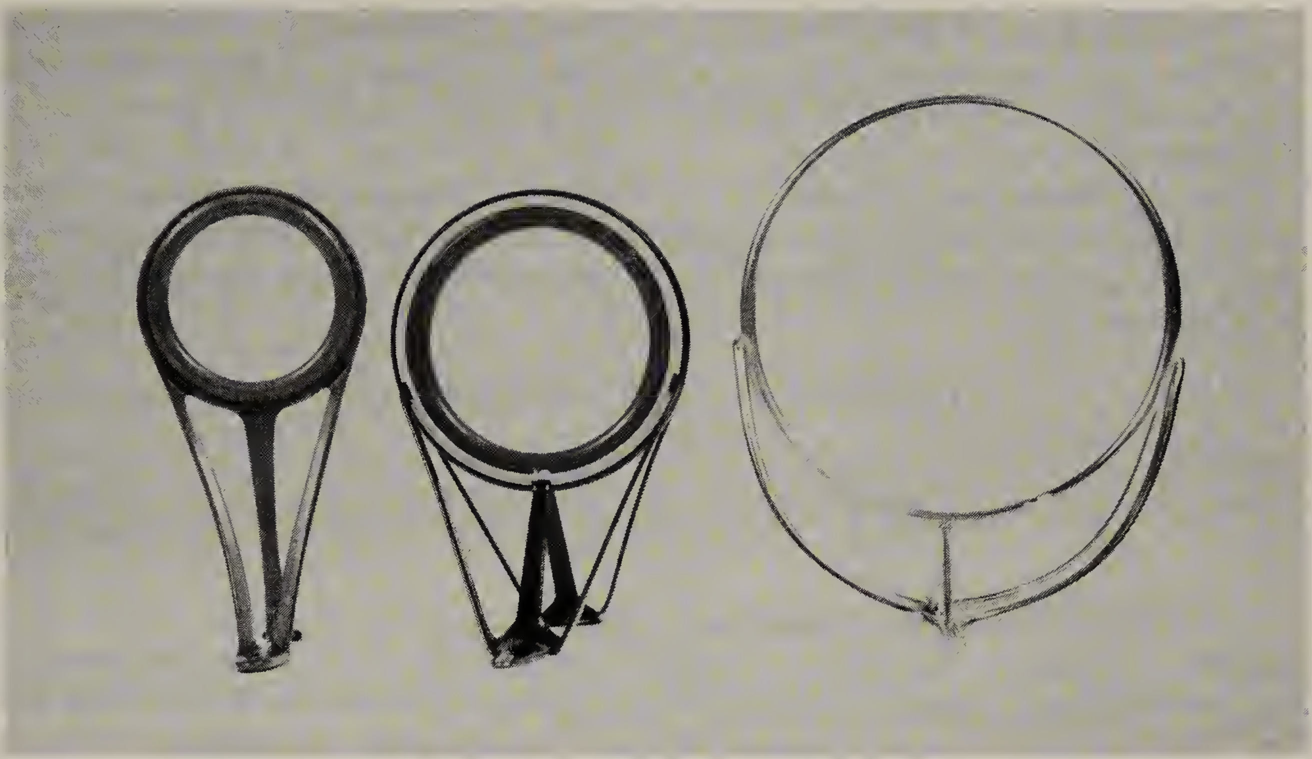
As you can see, the best combination is an SiC ring mounted (without a shock ring) directly into a frame made of brass.That is exactly how a Fuji USG boat guide is made. To protect the softer brass, it is given a unique gunsmoke hard-chrome plating. The same construction is used by Fuji in the RSG and Turbo guides. Any of these guides are the ones to use when for any reason you are not employing roller guides.

If the rod will not be used for fast-running or hard-running fish, then Silicon Nitride rings in the same high-sitting brass frames, model UNG and CRHG, will do the job. Any boat or trolling guides used must be very strong and ruggedly built. They must also be high enough at the butt end to keep the line from touching the foregrip, as discussed under guide placement. Pay particular attention to the ring size on the tip-top. It must be large enough for a double-line knot to clear without getting hung up. Many a fish has been lost at the end of the fight by too small a tip-top ring. The Fuji Model UST top has a large flanged ring. The SiC ring mushrooms out all the way around the edge of the tip-top. If the line from the fish gets suddenly pulled down or to one side, it cannot touch the frame but will contact only the SiC ceramic.

Before we leave boat and trolling guides, we should mention a currently popular update of the old New England trolling rod. Years ago, many Downeasters used a roller tip-top and a roller butt guide. The other guides were either tungsten carbide or chrome-plated wire. There has been a resurgence on the West Coast, but the non-roller guides are ceramic. It is an arrangement worth considering on certain rods.

Guides for surf, pier, and jetty rods. These rods are perhaps the best example of where the height of the guide (from the blank to the inside bottom of the guide ring) is definitely more important than the size of the guide ring. The principles were discussed under guide placement for spinning rods, and they are equally applicable to conventional revolving-spool rods for use in the surf. The only difference for the conventional rod is that you can use one size smaller high-frame guide for the butt guide.

In connection with guide placement on spinning rods, you'll recall that we refuted the



Surf spinning guides. From left: Fuji LVLG-40HH, Fuji BSHG-50, and Perfection Wire 75.

erroneous cone-of-flight theory. Much of the modern approach that we presented stems from the theory put forth originally in 1966 by Mr. R. Ohmura, surfcasting champion of Japan. The Japanese approach the sport of tournament casting much as they do the martial arts, with many years of dedicated preparation and discipline. Mr. Ohmura's theory is based on the centrifugal force of the line, and if you delve deeply into the theory and its modern application you learn that the height of the butt guide is most important. The ring size of the guide can vary with the pound test of the line, but if it sits high enough the largest ring size ever needed with 20-pound or heavier line is a size 40. if the line is under 20-pound test, a high-frame size 30 will do the job.

For many years American surf fishermen thought that a big wire butt guide and large subsequent guides were needed for a spinning rod. As we've learned, these guides sit too low and cause line slap, restricting casting distance. This can be seen most easily if we compare the height in millimeters of the larger ring guides.

HEIGHT COMPARISON—LARGE RING GUIDES

(Height in millimeters from blank to inside bottom of ring.)

Size	*Fuji High Frame HSG*	*Fuji High Frame SVLG*	*Fuji BSHG*	*Perfection Wire WCSL*
75				19.8
60				20.5
50			31.0	16.6
40HH		46.0		
40		29.0	23.8	16.0
30H	35.5			
30		23.8	18.5	12.5
25M	22.4			

It is quite apparent that the very large-ring wire guides are really counterproductive. First, the rings are so big that they do not choke the line enough at the butt guide to bring it under control. Second, they sit much too low. All of this causes line slap and reduces casting distance.

The Fuji high-frame HSG and SVLG were designed to produce long-distance casts on surf rods and are the best guides available for that job. Some fishermen believe the BSHG 50 makes the best butt guide for a surf rod because it is bigger. Not so. Let's look at it more closely.

	HSG-30H	*SVLG-40HH*	*BSHG-50*
Height	35.5	46.0	31.0
Weight	231.4	248.4	411.5
Feet	84.5	80.7	108.0

The BSHG-50 is lower than either of the two high-frame guides. It also weighs more than the other guides. Last of all, it is more restrictive to the action of the blank because the span of the feet is greater. Not shown in the table is the fact that the SVLG-40HH will flex better because of its spring steel as well as its frame design. So the BSHG-50 is not nearly as good a surf-rod butt guide as the HSG-30H or the SVLG-40HH.

It may help if we list some suggested guide sets. For the SLVG, use 40HH-40-25 and enough 16s to meet the stress-distrubution test. If the line used is 12-pound test or lighter, you can step down to a size 12 after one size 16. Suggested set for the HSG guides is 30H-25M-20L and enough 16LLs to meet the stress-distrubution test. For conventional-reel rods: HSG25M-25M-20L-20L and the needed 16LLs.

One final point before leaving surf rods and the importance of high-frame guides. Mr. R. Ohmura, the surfcasting champion, is also Mr. R. Ohmura, President of Fuji, the genius behind many of their innovative designs.

Different heights of three Fuji size 16 guides. From left: old BSHG, SVLG, and MVSG.

GENERAL HEIGHT COMPARISON

(Height in millimeters from blank to inside bottom of ring)

Company	Fuji	Fuji	Fuji	Fuji (old)	Perfection	Foulproof
Type	Surf	Flealight	General	General	General	Spin
Frame (1)	Two-Foot	1. Tri-Leg	1. Tri-Leg	1. Two-Foot	Two-Foot	Flex
(2)		2. One-Foot	2. One-Foot	2. One-Foot		
Models	HSG	1. MVSG	1. SVSG SVLG	1. BSHG	ACS	SP FM
		2. HLV	2. LVSG LVLG	2. BSPHG		FC
Size						
50				31.0		
40HH			46.0			
40			29.0	23.8		
30H	35.5					
30			23.8	18.5	14.0	9.0
25M	22.4					
25			19.3	17.5	12.3	9.5
20		31.2	16.4	13.8	11.7	5.0
20L	15.6					
16		26.8	13.0	10.1	9.5	4.7
16LL	11.0					
12		22.3	11.4	8.0	9.0	4.3
10		17.9	8.4	7.0	8.0	
8			7.3	5.1	6.0	3.0
7		14.0	5.6	4.0		
6		11.8				1.7
5		10.3				
5L		7.5				
4.5		5.7				

Note: One-foot guides can be bent slightly higher.

WEIGHT COMPARISON—CERAMIC GUIDES (SPINNING-ROD SETS)

6′-7′ Medium light rod. 30-25-20-16-12-8 and tip-top

Guides	*Weight* (grains)
Fuji SVSG/SVLG	269.9
Fuji BSHG	399.5
Perfection ACS	422.3

6′ Light rod. 25-20-16-12-8 and tip-top.

Guides	*Weight* (grains)
Fuji LVSG/LVLG (one-foot)	132.4
Fuji BSPHG (one-foot)	166.6

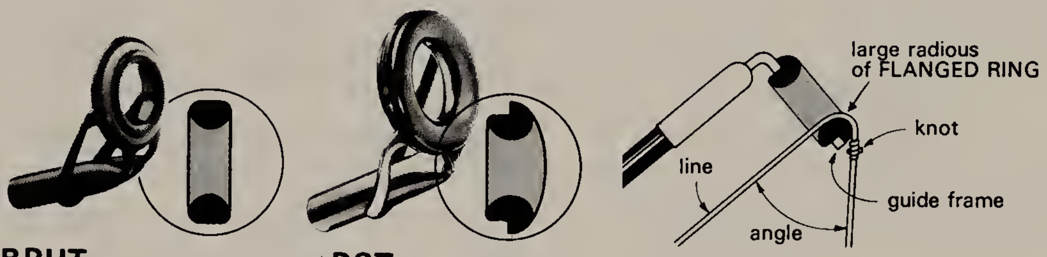
6′ Ultralight. 16-10-7-5-4.5 and tip-top.

Guides	*Weight* (grains)
Fuji MVSG	82.1
Fuji HLL (one-foot)	59.7

WEIGHT COMPARISON—TIP-TOPS

Where applicable, tip-tops used were size 6. Smaller sizes would be proportionately lighter.

Name	*Material*	*Weight* (grains)
Fuji MVST	SiC	5.3
Fuji MVLT	Hardloy	5.3
Fuji LST	SiC	6.9
Fuji LLT, BLLT	Hardloy	7.0
Perfection Fly PCF	Stainless Steel	8.0
Foulproof CCT	Monel Wire	9.2
Fuji PST	SiC	9.5
Fuji PHT, BPHT	Aluminum Oxide	13.9
Mildrum MAT	Aluminum Oxide	18.9
Perfection ACS	Aluminum Oxide	21.4
Mildrum MATS	Aluminum Oxide	22.1



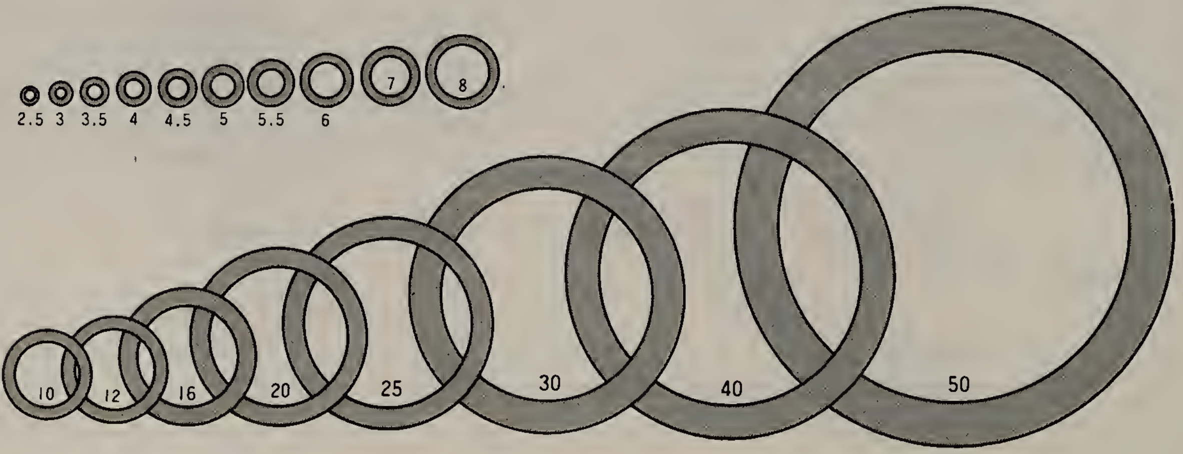
#BPHT **#PST**

Flanged ring of the new Fuji tip-top PST at right is a big improvement over old-style BPHT at left.

WEIGHT COMPARISON—FLY-ROD GUIDE SETS

Sets consist of applicable number of guides for 8-foot fly rods. Stripping guides (butt) vary as noted, as do tip-tops. Weight in grains.

Name	*Stripper*	*Weight Guides only*	*Tip Weight & Model*	*Total Weight*
Fuji SG/LG	SVSG	36.3	6.9 (LST)	43.2
Foulproof	Foulproof	40.5	9 (LLT)	49.5
Snake	Light wire	46.7	8 (Pear)	54.8



Ring size of Fuji guide rings.

FUJI GENERAL TRI-LEG

Models: SVSG, GSVSG, SVLG, BSVLG, GSVLG.

Size	*Weight*	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
4OHH	248.4	28.5	46.0	80.7
40	180.2	28.5	29.0	72.0
30	99.4	23.2	23.8	60.0
25	70.0	18.1	19.3	50.0
20	43.5	13.7	16.4	41.0
16	25.6	10.6	13.0	33.5
12	17.3	8.3	11.4	29.0
10	12.3	7.0	8.4	24.0
8	7.1	5.6	7.3	20.4
7	4.9	4.8	5.6	19.2

FUJI GENERAL ONE-FOOT

Models: LVSG, GLVSG, LVLG BLVLG, GLVLG

Size	*Weight*	*I.D.* (mm)	*Height* (mm)*	*Feet* (mm)
30	82.1	23.2	23.8	22.0
25	54.9	18.1	19.3	19.0
20	33.0	13.7	16.4	16.0
16	18.8	10.6	13.0	14.0
12	13.3	8.3	11.4	12.0
10	9.3	7.0	8.4	10.0
8	5.5	5.6	7.3	9.0
7	4.0	4.8	5.6	8.0

*Height as received. Can be bent higher.

FUJI FLEALIGHT TRI-LEG

Models: MVSG

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
20	53.7	13.7	31.2	59.0
16	37.3	10.6	26.8	51.5
12	23.1	8.3	22.3	45.5
10	16.7	7.0	17.9	40.0
7	9.6	4.8	14.0	30.0
6	5.5	4.1	11.8	28.5
5	4.3	3.0	10.3	27.8
5L	3.1	3.0	7.5	22.0
4.5	2.5	2.5	5.7	19.4

FUJI FLEALIGHT ONE-FOOT

Models: HLVLG

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)*	*Feet* (mm)
20	40.8	13.7	31.3	15.0
16	28.3	10.6	26.8	13.0
12	17.6	8.3	22.5	12.5
10	12.7	7.0	17.9	12.0
7	7.7	4.8	14.0	10.0
6	4.5	4.1	11.8	8.7
5	3.6	3.0	10.3	8.2
5L	2.7	3.0	7.5	7.6
4.5	2.1	2.5	5.7	6.8

*Height as received. Can be bent higher.

FUJI BSHG

Model: BSHG (Two-foot, shock ring)

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
50	411.5	38.4	31.0	108
40	260.0	26.5	23.8	93
30	151.20	21.5	18.5	75
25	100.4	16.3	17.5	64
20	65.4	12.3	13.8	54
16	37.7	9.4	10.1	46
12	21.0	7.5	8.0	39
10	15.7	6.4	7.0	34
8	9.9	5.0	5.1	28

FUJI BSPHG

Model: BSPHG (One-foot, shock ring)

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)*	*Feet* (mm)
30	91.0	21.5	18.5	22
25	66.1	16.3	17.5	19
20	42.8	12.3	13.8	16
16	23.0	9.4	10.1	14
12	14.8	7.5	8.0	12
10	11.4	6.4	7.0	10
8	6.0	5.0	5.1	9
7	4.5	4.3	4.0	8

*Height as received. Can be bent higher.

FUJI SURF TWO-FOOT

Model: HSG

Size	*Weight*	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
30H	231.4	23.2	35.5	84.5
25M	138.8	18.1	22.4	62.5
20L	92.6	13.7	15.6	47.0
16LL	61.7	10.6	11.0	42.0

FUJI BOAT TWO-FOOT

Models: USC, GUSC UNG

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
30	537.0	22.8	25.6	76.3
25	345.7	17.5	20.9	61.4
20	231.5	12.8	16.8	55.0
16	126.5	9.8	14.5	48.4
12	74.1	7.5	10.4	42.8
10	43.2	6.2	8.1	31.4
8	27.8	4.8	6.9	27.5

PERFECTION ACS

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
30	130.8	21.5	14.0	65
25	103.5	15.0	12.3	56
20	68.0	11.4	11.7	53
16	48.4	9.0	9.5	48
12	34.3	6.3	9	43
10	25.8	5.2	8	38
8	16.3	4.2	6	32

MILDRUM LINESAVERS MAC

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
24	165.5	19.5	17.3	86
17	72.3	11.3	12.5	73
12	39.3	7.5	9.0	54
10	28.1	6.3	8.3	43
8	18.1	4.5	6.5	37

PERFECTION WIRE WCSL

Wire guide ring and frame

Size	*Weight* (grains)	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)
75	314.8	66.6	19.8	102
60	253.1	54.7	20.5	105
50	200.6	40.2	16.6	85
40	135.8	33.6	16.0	82
30	91.1	25.8	12.5	68
24	58.9	20.0	9.4	56
20	47.5	17.3	9.5	53
16	35.3	12.5	8.0	48
14	26.1	10.7	7.6	43
12	22.9	8.9	6.8	38
10	13.3	7.0	5.3	32
8	9.4	5.7	5.3	28

FOULPROOF

Size	*Weight* (grains)*	*I.D.* (mm)	*Height* (mm)	*Feet* (mm)†
SP-1$^{1}/_{8}$	95.2	28.6	9.5	95
SP-$^{7}/_{8}$	58.6	22.2	9.0	80
SP-$^{3}/_{4}$	55.8	19.0	9.0	73
SP-$^{5}/_{8}$	30.6	15.9	6.7	69
SP-$^{1}/_{2}$	23.9	12.7	5.0	54
FM-$^{3}/_{8}$	12.8	9.5	4.7	49
FM-$^{5}/_{16}$	10.8	7.9	4.3	48
FM-$^{1}/_{4}$	10.0	6.4	4.0	45
FC-$^{3}/_{16}$	4.9	4.8	3.0	38
FC-$^{5}/_{32}$	4.6	4.0	1.7	38

*Also made in additional series of smaller-diameter wire.

†Feet are widely spaced and guide flexes, hence distance is not good measure of restrictiveness.

SEVEN

Wraps and Wrapping Techniques

Wrapping techniques and wrap designs are of great interest to the majority of custom rod builders. While there are those who prefer to keep wraps quite simple and subdued, intricate designs and patterns are a creative means of expression to a great many of us. I have noticed that the first thing examined when someone is handed a custom rod is invariably the wraps. This is not only true with bright or fancy wraps, but with those which are quite plain as well. Possibly this is the one area of craftsmanship which the nonbuilder feels he is qualified to evaluate. It is also interesting to note that the wraps are one of the first specific areas of workmanship that the custom rod builder either points out to the novice or expects him to examine. Whatever the reasons, it certainly seems important that we, as custom builders, develop a firm mastery of wrapping techniques.

It should be pointed out that this chapter is written under the assumption that the reader already knows the very basic steps involved in making wraps. I do not mean we will not be touching on some very fundamental techniques, for to improve in any skill it is often necessary to return periodically to the basics. However, for the reader who has not already wrapped some rods, I would strongly suggest he read *Fiberglass Rod Making,* where step-by-step, detailed instructions are given. Basically, I have tried here to pick up where I left off in the first book, and to cover areas either not covered there or not covered in depth. The fundamentals which we will explore are those on which I have received numerous questions.

PREPARATION AND MATERIALS

Removing the factory logo from the blank. On some occasions we find ourselves working with a blank on which the company's logo has been placed beneath the final finish, and we would prefer to remove it. Normal solvents such as alcohol, acetone, and lacquer thinner will have no effect. In fact, if we use a solvent strong enough to remove the factory-applied finish we run a real risk of having that solvent also attack the resin bonding the fibers together. In some situations the logo presents no problem because the design and layout permits placing a decorative butt wrap over it. If this is not the case, then the best method I have found is to carefully scrape away the factory finish. Use a fairly sharp, thin blade such as a single-edge razor blade, a Rod Builder's Knife, or an X-Acto knife. Hold the blade at right angles to the axis of the blank. This is important to prevent slicing or digging into the blank. Work with single strokes long enough to cover the area of finish to be removed. Scrape only deep enough to remove the finish and the imprinted logo, making certain you are not scraping the fibers of the blank. You can smooth the scrape marks and feather the ends with very fine sandpaper or fine steel wool. Wipe with a cloth moistened in a mild solvent and, when dry, lightly wipe with a tack rag. The first coat of your wrapping finish can be extended from the butt wrap to cover the scraped area, and it will be restored to like-new condition. A thin finish such as Crystal Coat works best here, since the end can be brushed out and feathered into the unscraped factory finish.

Installing tip-tops. Many years ago, tip-tops were mounted with thermoplastic ferrule cement. While this hot-melt glue was quick, it was very low in strength. Also, if a rod was stored in the hot trunk of a car, the glue would soften and the tip rotate out of alignment. By far a better method is to use five-minute epoxy glue. It's almost as fast as ferrule cement and a great many times stronger.

Use only a very small amount of this glue, mixed well. After slipping the tip-top over the blank's tip, immediately wipe off any excess. Lay the blank on a flat surface with your mark indicating the side on which the guides will be placed facing straight up. A couple of pieces of masking tape will hold the blank in that position. Rotate the tip-top until it is exactly in line with your mark. Within a few more minutes the glue will set and you can untape the blank and proceed. If the tip-top ever becomes damaged and must be replaced, heat from a soldering gun applied to the tube will break the bond. The one exception to this method is when mounting roller tops. Then the bond should be as strong as possible and permanent, so use regular long-setting epoxy. The roller frame will never need to be removed, since replacement roller parts are available.

Taping on guides. Robert "Mac" McCowan, a fine rod builder and a good friend of mine, once sent me a humorous poem stating that the single most important component in building rods was masking tape. For many of us, he wasn't too far wrong, since there are so very many applications. One of its primary uses is in taping guides in place while being wrapped, and in temporarily holding threads while making intricate wraps. Very narrow tape can be used to mark the spine on a rod, and some builders prefer a band of narrow tape on each guide foot. Tape in various widths, especially the narrow sizes, can be purchased at auto paint supply dealers.

If you do any amount of wrapping you will find a heavy tape dispenser invaluable. These are readily available in office-supply stores, and I know many rod builders who use two—one for narrow and one for regular. Think of how many times you pick up a roll of tape and either cut or tear off a piece. With a tape dispenser handy all you need to do is reach up with one hand, pull off the desired length, and pull it across the cutting edge on the front. The weight of these units keeps them from tipping over or moving beneath your hand. Let me make another suggestion on a time-saving tool. Instead of small scissors, use a pair of snips of the type with no finger holes and an internal spring that pushes them back open. They come with replaceable blades and are an excellent investment. Check your rod-building-supply dealer.

Heavy tape dispenser holds wide and narrow masking tape.

Thread

Size. In my travels I am surprised at how many rod builders use thread of a heavier size than needed. Naturally, heavier thread is a mite easier to wrap, but it does not give nearly the beauty and visual appeal of finer thread. Some people erroneously assume that heavier thread is needed for added strength. Size A thread is amazingly strong and should be used on freshwater rods of all kinds. If you are using anything heavier, try A on your next rod and see how much better it looks. There will be less bulk around the guides and the individual threads will be almost invisible after finishing. Your intricate butt wraps will also be less bulky and look better. Size D is plenty strong enough for all kinds of saltwater rods, even offshore trolling rods. By comparison, E or EE looks like rope on the finished product.

NCP thread and regular thread. NCP, of course, stands for "No Color Preserver", meaning that the thread so designated will retain its color when any kind of finish is applied directly. A better explanation is that NCP thread has been treated so that it is opaque. You cannot see through it, nor will light pass through it. Most important, the color underneath NCP thread will not show through or "bleed." Light-colored NCP thread on a dark blank will retain its original light color. This is not true for regular thread. If the finish is applied directly to it, without color preserver, it becomes translucent and the color underneath shows through. Light-colored regular thread on a dark blank will lose just about all color and go "muddy" if no color preserver is used. Darker colors of regular thread without color preserver will become a bit darker, but the guide feet will be visible through the wrap. As we will see later when discussing some intricate patterns, these characteristics of both regular and NCP thread can be used quite creatively. However, for now, let's see if we can't more fully understand the differences between these two types of thread.

When using a dark blank or a dark underwrap, light-colored regular thread must have color preserver. However, even with the required number of coats, the light color loses some of its snap. White doesn't look pure white. Instead, it takes on a slight grayish cast.

Nor will the color be even. It will look different just along the sides of the guide feet. This dull, mottled effect is what is referred to as blushing. The easiest way to correct it is to use NCP thread for white and light colors, such as yellow. Not only will it eliminate the problem associated with dark blanks or dark underwraps, but it will look much better on gold and other light-colored blanks.

You might be thinking that if this is the case, why not use NCP thread in all colors and be done with it? The reason is that in the medium and darker colors NCP looks flat. It lacks the sparkle and snap of regular thread. You can easily see this difference when comparing samples of both finished threads in the sunlight. So a good rule to follow for wraps, as well as trim bands, is to use NCP for light colors and regular thread for medium and dark colors. You'll be surprised at how much better your wraps will look.

Since we have brought up the subject of NCP thread, you should be aware that it should never be stored in sunlight or fluorescent light. The chemicals used to make this thread opaque will cause it to lose strength and deteriorate from prolonged exposure to either of these light sources. In extreme cases the exposed thread will pull apart in your hands. Once NCP thread has been finished, this problem no longer exists.

Storage and handling. All thread should be stored where it will be dust-free. Minute particles of dust adhere to thread, making it next to impossible to get a smooth, glasslike finish. Another suggestion when working with thread is to always wash your hands in soap and water beforehand. If your wrapping session is a long one, stop and again wash your hands in the middle of your work. Perspiration contains body oils. These are absorbed by the thread, but do not make their appearance known until the finish is applied. Then the thread mysteriously becomes mottled.

BASIC WRAPPING TECHNIQUES

Guide alignment. Thread tension should be moderate. After wrapping a guide, you should be able to adjust its position slightly. A by-product of proper tension is that it eliminates the need for a lot of time spent beforehand in getting the guides all perfectly aligned. Instead, try only a rough, estimated alignment initially. Then, after the first guide foot below the tip-top is wrapped, move the guide to either side as needed. After the second foot is wrapped, again make any needed adjustments. Continue in this manner until all guides are wrapped. Just before applying the color preserver, make a final, accurate check.

Instead of the traditional method of sighting along the blank and looking through the guides, I have changed to sighting from the back side of the blank. It is faster and much more accurate. Hold the blank out at arm's length with the guides on the far side and the blank tilted up, nearly vertical. Twist the blank slightly in your hand until the tip of the blank exactly bisects the ring on the tip top. Without moving the blank, glance at the first guide below the tip-top. The blank should once again be in the exact center of the guide ring. If not, move it as required. Just continue down the blank from guide to guide in the same fashion. When you have finished, each guide will be perfectly aligned with the tip-top.

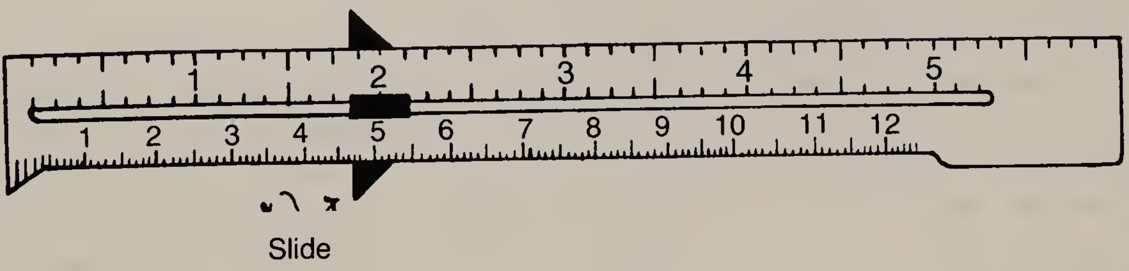
Aligning guides by viewing from back.

Wrap length. One sign of good craftsmanship is that the length of each guide wrap is directly proportionate to the size of the guide. (This is, of course, for the normal rod where wraps are not being adjusted to modify the action.) As the sizes of the guides diminish, so do the lengths of the guide feet. We can maintain proper proportion, then, if we make the length of the wrap in front of each guide foot the same on all guides. The total length of the wraps will automatically be shorter on the smaller guides.

To determine this constant length in front of each guide foot, select a guide near the middle of the rod. Make a test wrap to decide on a length that looks appropriate. Take a piece of white card stock or fairly stiff paper and hold it along the blank next to the wrapped guide. On the card place a small pencil mark at the beginning of the wrap, and another at the beginning of the guide foot. This is the distance in front of each guide foot that you want to start each wrap. To use your simple measuring card, hold it next to the blank so one pencil mark is at the leading edge of a guide foot. Use a scriber to make a small scratch in the surface finish of the blank opposite the second pencil mark. Now, all you need to do is start your wrap on the scratch and continue wrapping up over the guide foot. Make sure you end the wrap at the same point on each guide.

This technique is applicable if you are already in the habit of measuring a given distance in front of each guide foot with a ruler. Simply measure the distance once, on the white card, and you will find you can work much faster than measuring each wrap individually.

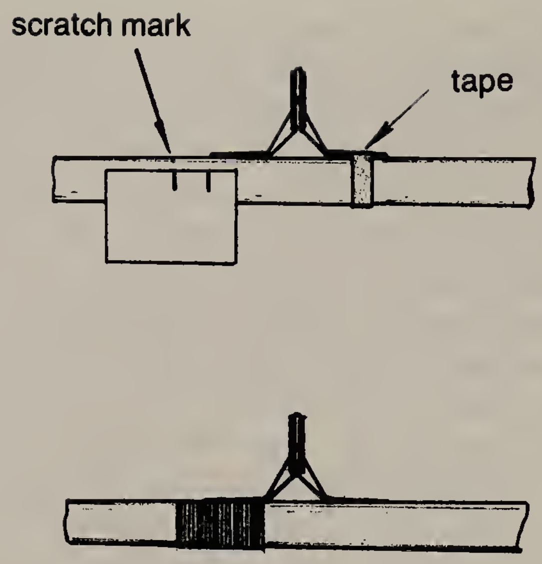
Another way to do essentially the same thing is with a little tool you can pick up in any sewing-notions store. It's called a seam gauge or a sewing and knitting gauge. The good ones (don't mess with the cheap ones) have an inch scale on top and a millimeter scale on the bottom. The slide will have sharp points on top and bottom, (usually in red) and a push knob in the center for your thumb. There is enough friction on the slide so that once it's set to a particular measurement it will remain there until you forceably change it.



Seam gauge, or sewing and knitting gauge.

Since this tool is much like a caliper, it is a snap to use it like the card to measure the constant space in front of the guide foot. Another approach is to set it for the length of wrap you want. You can then make wraps of identical length on each foot even though the length of the two feet may vary. Also, if you want to progressively increase the length of the wrap in front of the guide feet it is easy to do with this little tool.

Concealing and trimming thread ends. When a wrap is made it is started by wrapping the thread over itself for a number of turns. Then the loose end is trimmed off. Similarly, when a wrap is ended, the thread is pulled under the previous winds. This automatically produces two small humps in the wrap, one at the beginning and one at the end. In order to minimize their obviousness on the finished rod, always plan on hiding them. By that I mean locate the start and the tie-off loop opposite the side of the rod normally seen by the person fishing it. On fly rods and spinning rods this is on the same side as the guides. On casting rods and trolling rods it is on the side opposite the guides.



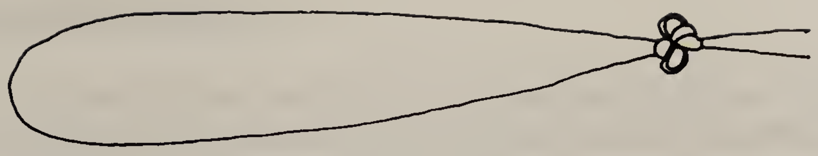
Keeping wraps equal.

If you are not careful, a small nub of thread will protrude where the thread has been trimmed after being pulled under by the tie-off loop. This will usually not be noticeable until the finish is applied. Then it stands up like a stiff flag, destroying the beauty of the wrap. A couple of techniques can be used to prevent these ends from poking through. First, trim the thread as close as possible with a decisive cut of a *sharp* blade made parallel with the wrap. Single-edge razor blades are not as sharp as double-edge blades. However, the edge dulls faster on a double-edge blade. You can cut a double-edge blade in half lengthwise with a pair of scissors. A couple of strips of masking tape folded over the cut edge will make it easy to handle. Or use a Rod Builder's Knife or an X-Acto knife with a relatively new blade which is still quite sharp.

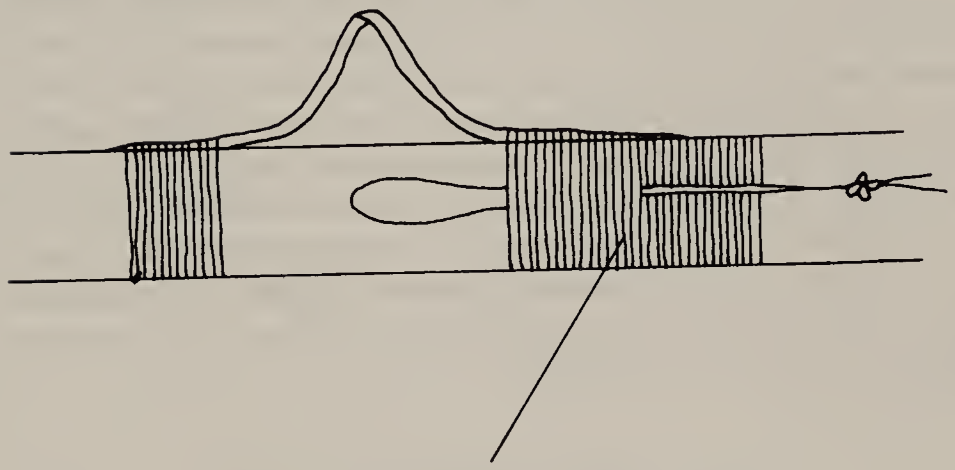
After the thread is trimmed as close as possible, use your thumbnail (or the angled edge of a thread tool) to push the thread beneath the wrap in the direction of the windings. Apply pressure near the thread end, where it was just trimmed, and at about a 45° angle toward the outer edge of the wrap. The idea is to move the hidden, wrapped-over thread away from the spot where it was trimmed. In doing so it will automatically be drawn under the wrap. Some rod builders use an alcohol lamp with a clean, carbonless flame to very quickly singe the wrap. This eliminates any fine strand of fuzz that might have extended from the thread when it was trimmed. However, a decisive cut with a sharp blade should not leave any such fuzz.

Another technique is used by RodCrafter Jim Conaty. He uses a tie-off loop of fine monofilament about 2 inches long and knotted at the end. Several knots jammed against each other provide a bit of a handle to assist when pulling the loop under. Instead of inserting his tie-off loop at the usual 6 to 8 turns before the end, Jim inserts his much earlier in the wrap, and continues wrapping over it. When the end of the wrap is reached, the winding thread is cut as usual and the end inserted into the tie-off loop. He then *slowly* withdraws the loop until it is just barely drawing the end under the wrap. At this point the thread is taut and will not loosen when the tie-off loop is temporarily released. The end of the thread is cut as closely as possible to the loop, and the loop withdrawn. The cut end of the thread will drop out of the loop underneath the wrap instead of coming all the way out with the loop. No trimming is necessary since the end is buried beneath the wrap.

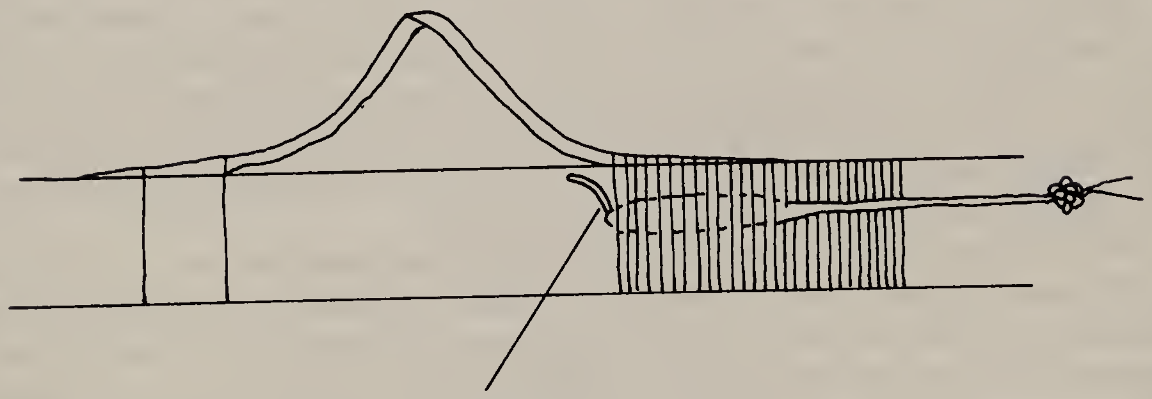
Avoiding gaps. One very obvious sign of the neophyte rod builder is the small gaps



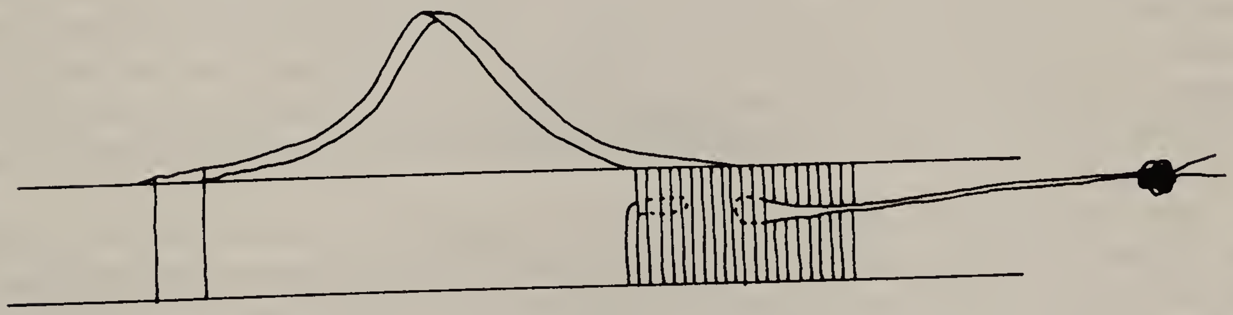
A tie off loop of fine monofilament



B insert tie-off loop as early as possible



C cut here



D end of thread is lost under the wrap leaving no end to trim

Eliminating nubs. A: Tie-off loop of fine monofilament. B: Loop inserted early in wrap. C: Thread drawn taut and cut short. D: Loop withdrawn and end buried.

and spaces between individual threads in a wrap. If the thread is wound on evenly there will be very few of these, but even the most experienced professional has some present. The way to eliminate them is to burnish the wrap after it is complete. With underwraps this should be done before the overwrap is started. I formerly used my thumbnail for this until I was introduced to the slick little thread tool—and burnisher—by RodCrafter George Fish. This handy, dandy little gadget is described in the chapter on tools. Here, we'll just discuss using it as a burnisher. Actually, any small-diameter, rounded, highly polished piece of metal will work as a burnisher. Russ Jacobs uses a large darning needle, Richard Jankauskas the finger loops on a pair of surgical scissors, and Joy Dunlap an anodized-aluminum knitting needle. I am sure there are many more objects similarly used.

To burnish a wrap, rub the tool back and forth along the wrap while slowly rotating the supported blank. You must be careful at the ends of the wrap or you will open new gaps between the threads. If you are right-handed, use your left thumbnail placed against the left end of the wrap as a stop. A small-diameter tool will enable you to stroke all the way to the left end until the burnisher automatically stops against your thumbnail. On the end of the wrap to your right, stroke the tool from right to left with light pressure over the end and continuing into the center of the wrap.

UNDERWRAPS

The technique of underwrapping guides probably originated with heavier saltwater rods. The idea is to provide a cushion beneath the feet of the guide to protect the blank. Since larger guides with longer feet are used on these rods, the amount of movement between the inflexible guide and the flexing blank is increased. The underwrap therefore provides a buffer against abrasion in this situation. Because of the design of the feet, the weight of the guides, and the stress present, roller-guide manufacturers recommend that this particular type of guide always be underwrapped.

Over the years, underwrapping spread to other rods, including those for freshwater use. My guess is that at least a couple of things contributed to this. First, the same principle of protecting the blank with a cushion seemed to make good sense. Second, the appearance of an underwrapped guide was attractive to many rod builders and fishermen. Three complementary colors could be brought into use for an appealing design. There was the basic color of the blank, the color of the underwrap which appeared in the interior space beneath the guide ring and at the ends of the wrap, and finally the color of the guide wrap itself. We have all seen very handsome examples of this. Some rod builders have become so convinced of the merits of underwrapping that they regard any rod except the lightest of spinning rods and fly rods as inferior if they are not made with underwraps. Inevitably, there developed two schools of thought on the subject and many heated debates have ensued.

Now, don't get me wrong. I am not against underwraps. I personally believe custom rod building is a creative means of expression, and each rod builder should therefore do his own thing. Nor do I think I am expert enough to take up the cause for either side in defense of that position. I do believe that before a person makes a decision on which course to follow he should at least hear the other side of the argument.

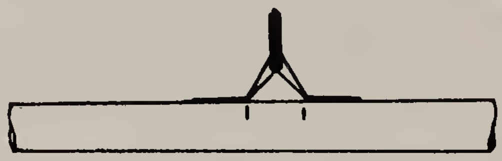
Underwraps do add stiffness to the blank. A great deal of pressure is exerted from a wrap of even Size A thread, adding hoop strength to the blank at that point. This principle of restrictiveness to flexing was discussed in connection with modifying the action in the chapter on the blank. When we add two layers of thread it is more restrictive than one layer. It is like adding wall thickness to the blank. Usually the top layer (the guide wrap) is of a size larger thread than the underwrap. Larger thread requires a heavier finish, so we compound the stiffening factor. If our objective is to stiffen the rod, underwrapping will help. But if we want to retain the original action, it would be better not to underwrap.

The cushioning and protective aspects of an underwrap are not needed on most rods if the guide feet are properly prepared by a technique similar to the one explained in the chapter on guides. Underwraps add bulk to the appearance of guide wraps. This is less noticeable on large-diameter saltwater rods, but fairly apparent on most freshwater rods. The smaller the diameter of the blank, the more noticeable is the increased bulk. Underwrapped guides on light graphite blanks begin to look out of proportion to many people.

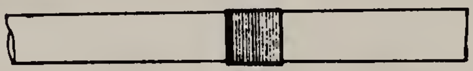
Those are the main arguments advanced or defended by each side of the question.

False underwraps. If you like the appearance of an underwrapped guide but do not want the bulk or the stiffening effect on a light rod, let me suggest what I call "false underwraps." This is a wrap that has only one layer of thread throughout, but visually is the same as an underwrapped guide.

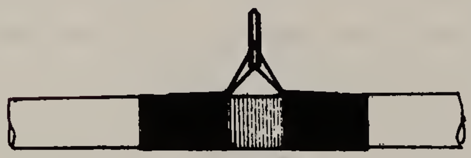
Let's assume you want to imitate the effect of a silver underwrap with dark-blue guide wraps. You need a band of silver between the guide feet. This must be wrapped on the blank before the guide is wrapped on. Hold the guide in the exact position where it will later be wrapped. With a scriber, carefully place a scratch at each point where the guide wraps will end nearest the guide ring. Remove the guide and make your silver wrap between these two scratches—begin and end the wrap exactly on each mark.



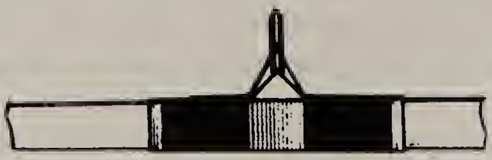
mark position for false underwrap



underwrap in place



guide wrap in place



trim bands added

Making false underwraps.

Next, carefully center the guide over the band of silver thread, and tape one foot to the blank. Make a dark-blue wrap over the untaped foot. Remove the tape and make a matching dark-blue wrap over the remaining guide foot. All that remains to be done is to place a trim band of silver on each end of the wrap.

The underwraps

When making true underwraps, you have to be very careful to maintain proper proportions for each different-size guide. The guide wrap should start at exactly the same distance from the leading edge of every guide foot. The width of the trim band on each end of the wrap (the extended underwrap) should be exactly the same on all wraps. When we consider that (1) the underwrap must be made first, (2) it must be precisely centered on the spot where the guide ring is to be placed, and (3) it must be exactly the right length for that size guide, it's easy to see why many underwrapped rods lack the precision expected of custom work.

Below is a procedure which will ensure perfect results. Let me suggest you use the metric system, since it is so much easier to work with. Small rulers marked in millimeters are readily available. You will need a sheet of paper on which you can list vertically each of the guides by size, and space for five more vertical columns. You also should have the blank marked with a scratch at the point where each guide ring is to be placed.

1. Measure the span of each guide from the end of one foot to the end of the other. Write this figure next to the guide size in Column 1.
2. Determine the length of the guide wrap you want to have in front of each guide foot. Since there are two guide feet, multiply this number by 2 and write it in Column 2 after each size guide.
3. Determine the length of the trim band (extended underwrap) you want on each end of the wraps. Again, since there are two ends to a wrap, multiply by 2 and list in Column 3 after each size guide.
4. To determine the total length of the entire underwrap, add the figures in Columns 1, 2, and 3 and write the result in Column 4. This figure will naturally be different for each size guide.
5. To find the center of the underwrap, or rather the length on each side of the center, divide the figure in Column 4 (total length of underwrap) by 2. Write it in Column 5.
6. Now go to the blank and locate the scratch for the guide ring position of the first guide. Opposite that guide size in Column 5 of the table is the length on either side of the center scratch. Measure that length and make a scratch on each side. This is the length and position of your underwrap for that size guide.
7. Start your underwrap (Size A) precisely on one scratch mark and wrap, over the center scratch, to the other scratch mark. End the wrap exactly on the scratch.
8. If you are going to include a "guide-ring trim band" in the center of the underwrap (directly below where the guide ring will be located), make it now. Measure to the center of the underwrap and place a pencil dot on the thread. Center your narrow guide-ring trim band over the dot. Next position the guide over the trim band and tape one foot. Measure the distance from the end of each guide foot to the end of the underwrap to make sure the guide is exactly centered. (If guide-ring trim band is used, center the guide by measuring the space at each end and tape one foot of the guide. Check again to make sure the guide is in the exact center of the underwrap.)
9. On a piece of card stock, measure and mark the length of the trim band (exposed underwrap) that is to be on the end of each wrap. This is one-half of the figure in Column 3. Hold this card next to the blank and the taped guide. Align one mark with the edge of

the underwrap, and start your guide wrap (Size D) at the other mark. *This card and this measurement will be used for all guides,* since the length of the trim band is to be the same on each wrap.

*UNDERWRAP TABLE**

Size	*1* *Guide foot length*	*2* *Underwrap length*	*3* *Trim Band length*	*4* *Total*	*5* *Length each side of center*
SVSG-8	20	10	4	34	17
SVSG-10	24	10	4	38	19
SVSG-12	29	10	4	43	22.5
SVSG-16	34	10	4	48	24
SVSG-20	41	10	4	55	27.5
SVSG-25	50	10	4	64	32

*All measurements in millimeters

Always save the table you constructed for future reference. The next time you use that model guide and those sizes, just refer to the table. It is then a snap to mark the ends of the underwraps. Such tables can be prepared ahead of time for the guides you use most frequently. While the procedure will seem a bit cumbersome the first time, you will quickly get the hang of it and be able to work quickly. After you have a few tables prepared as well, you'll breeze through the job. Most important, your guide wraps and underwraps will all be perfectly proportioned and sized to fit the guides. Your work will look like—and be—the work of a master craftsman.

It should be mentioned here that some rod makers find a self-centering ruler of help when locating the midpoint of an underwrap. These are generally short rulers with zero in the middle and the figures running in each direction out from zero. If you decide to try one, make sure it is marked in millimeters rather than inches. They are available at all graphic-arts-supply stores.

POWER WRAPPING

If you build many rods, you will at some point consider the feasibility of making your wraps on a powered lathe or wrapping jig. My guess is that you will reach that point sooner if you use many underwraps or make many saltwater rods. In both of these situations, the time saving can be substantial, not to mention the increased enjoyment.

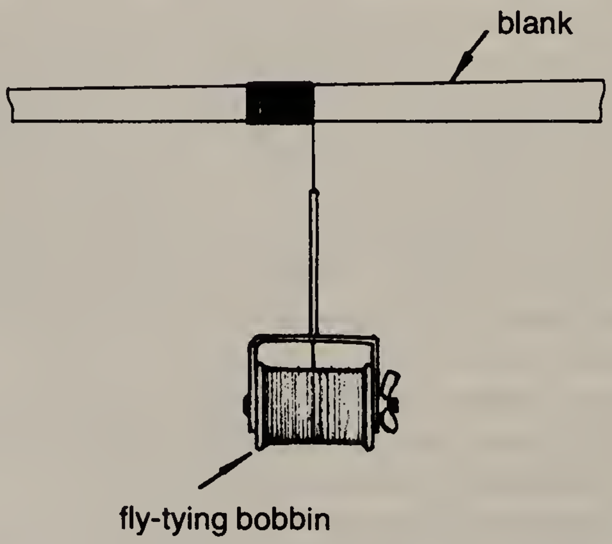
In the chapter on tools, you will find some ideas for a powered rod-building lathe. Here, we are primarily concerned with technique, and the equipment aspects that might affect technique. Some rod builders make things very difficult for themselves without realizing it. They devise a set-up where the blank cannot be easily turned forward or backward by hand while in the power wrapping mode. This resistance to easy turning could come from a geared motor or from heavy belt-and-pulley friction or any number of things.

Whatever the cause, it creates a problem whenever the thread inadvertently climbs upon itself—which it will do from time to time. If you cannot simply back off the thread by pulling on it while maintaining thread tension, you have a frustrating and time-consuming problem. If you are working on the butt guide, you perhaps can reach the chuck or motor pulley and turn it with your left hand while backing off the thread with your right hand. However, if you are wrapping further up the rod, it soon becomes impossible to reach far enough. How simple it would be, instead, to be able to turn the blank backward with one hand, even if you were working on the fragile tip section of a graphite fly blank. Another source of frustration is starting the wrap or inlaying a thread or making a trim band. All of these are a breeze if the blank can be turned easily in either direction by hand. If not, you'll spend more time starting and ending the wrap than you saved by power wrapping the middle.

The practical power-wrapping set-up, then, will allow the blank to be turned easily by hand at the same time it is turned by power. The control should come from a variable-speed foot pedal of the type used on a sewing machine. This frees both hands. With a tool of this type, you can mix hand and power wrapping all on one wrap. For example, you can start the wrap exactly as you always do, using hand power. After a couple turns, let your foot take over for a few more turns. Stop and cut the tag end of the thread and power wrap to the point where you will insert the tie-off loop. Switch to hand turning until you have the loop in exactly the position desired—and so on until the wrap is complete.

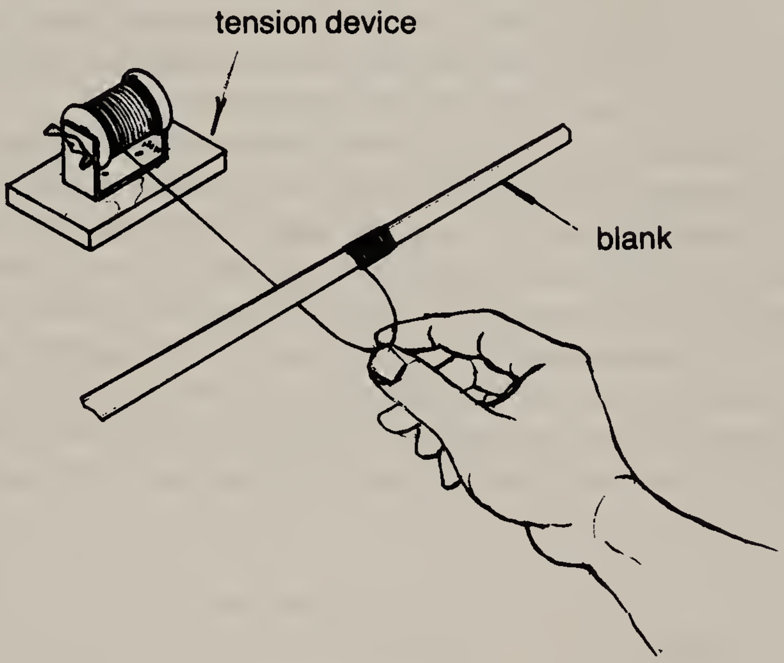
There is one set-up that avoids the back pressure mentioned above, but it presents its own problems. This is a direct-drive sewing-machine motor. The rod blank is often attached to the ¼-inch motor shaft by a sleeve and butt-cap arrangement. These little $^1/_{15}$ horsepower motors are very fast—5,000 r.p.m., no load. You barely depress the foot pedal and the rod goes from stop to high speed. If the foot is held there, you overshoot your mark most of the time. A special "stabbing" technique is needed with the foot, just very short bursts. In reality, you must anticipate and react ahead of the machine. It can be done, of course. It is the system used most by the wrappers in a rod company. However, it takes a lot of work to learn to wrap this way. Rod companies tell me it takes at least two weeks to train a worker, and that's a forty-hour week. You thereafter need to do enough work each week to remain proficient. I would say that at least 95% of the custom rod builders will do better with a rod-lathe arrangement similar to the one in the chapter on tools.

There are many different techniques you can develop after you have a good workable set-up. The thread can be fed to the rotating blank under the required tension by various methods. If you purchase your rod-wrapping thread on small spools, you can use a fly-tying bobbin. Even if you purchase thread on large spools, you can use your power wrapper or perhaps your spouse's sewing machine to load small spools for the fly-tying bobbin. Some rod buiders just hold a 1-ounce spool loosely in their cupped hand so that it



Power underwraps.

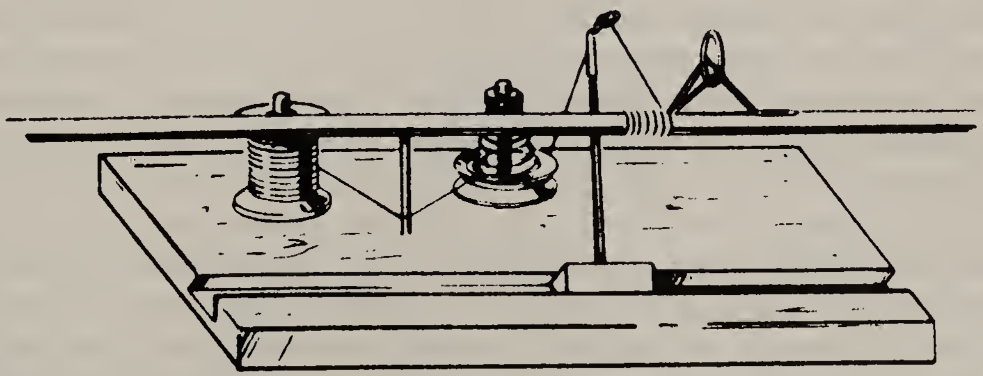
can rotate by bouncing around inside the hand. Tension will automatically be controlled as needed by your hand. Still other rod builders use their regular thread tension device placed behind the blank. They pull the thread out in a long loop to the front of the lathe where it passes through the thumb and index finger so that it can be guided onto the blank. Another method is to make a thread holder big enough for the size spools you use, and slide it along the workbench in front of the lathe.



Power underwraps.

I resisted power wrapping for a number of years, because I couldn't come up with the proper set-up. Finally, I worked out an arrangement that had very little back pressure and I was able to mix hand and power wrapping together as explained above. At the same time, I stumbled upon a simple sliding thread-feed-and-tension accessory that can be used with any power wrapper. It made all the difference in the world for me, and I know it has helped a great many others as well.

I'm used to having the thread come from high and behind the blank. Some people prefer it to come from low and in front. This little tool can be set up either way. It basically consists of a rectangular board with a dovetailed groove along the front. Into this groove is fitted a small block that can be slid along the groove. Behind the groove is a post to hold the thread spool, a post around which the thread is routed, and a sewing-

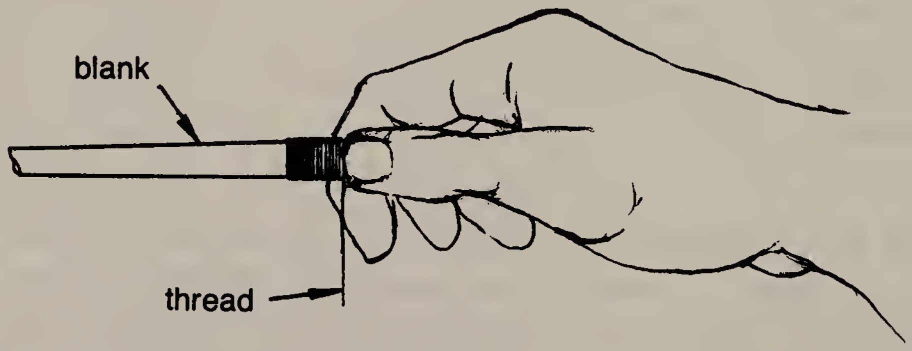


Thread Feed and Tension Accessory makes power wrapping much easier.

machine type adjustable thread-tension tool. From the tensioner, the thread is routed to the sliding block. If the unit is located in front of the blank, a screw eye is placed in the block through which the thread can pass. If the unit is located behind the rod blank, the sliding block is fitted with a stainless post and tip-top which routes the thread high enough to clear the blank.

To use the unit, set it on your bench in front of the rod or behind it, as noted. Use your left hand to slide the block along the groove as your wrap progresses, feeding the thread to the blank. In this way, the thread lies evenly on the blank without gaps. In no time at all, you will be able to coordinate the rate at which you slide the blank with the lathe's speed produced by your foot control. It's just that easy.

One good technique for guiding the thread onto the blank so that it does not climb over itself is to use the thumbnail of your right hand. This assumes you wrap from left to right. Place the thumbnail against the leading edge of the wrap just where the thread is being fed in. Your left hand controls the angle of the thread and the tension. Keep the left hand slightly ahead of the developing wrap so the angle is never quite 90°. Your right hand can be loosely cupped around the rotating blank. As the underwrap is made just keep your thumbnail pressed against the leading edge of the wrap and slide your hand from left to right in time with the speed of the lathe. You will find that this method automatically packs the thread tightly against itself as the wrap progresses. All underwraps should be burnished.



Using the thumbnail to guide thread into place.

WRAPPING FERRULES

Regardless of the type of glass-to-glass or graphite-to-graphite ferrule, the *female* portion should always be wrapped. This provides additional hoop strength at this critical juncture, and greatly increases strength. Actually, a band about 1/4 inch wide located near the end will give us the extra strength. However, it is not too appealing cosmetically, so most of us wrap the entire ferrule and pick up a little extra insurance in the bargain. Depending on the exact configuration, the female ferrule is either wrapped to a length of the male penetration plus 1/4 inch or to the point where the diameter reduces to the normal taper of the blank.

In order to keep the bulk (O.D.) to a minimum, either size "OO" or "A" thread is used. The most important aspect of the wrap is the thread tension. *Do not use a lot of tension* or you will constrict the size (or opening) of the female ferrule. When that happens, the male section will not penetrate as far as it should, and a potential shear point is created where the rod may break. Or a good friction lock will not be created and it will be possible to cast off the tip section. Remember that since there are more turns per inch of fine thread, such as "OO" or "A", the cumulative tension applied to the blank is greater.

I have seen cases where people used too much tension and restricted the ferrule opening to such a degree that they could not even begin to insert the male ferrule. Years ago I tried wrapping a joined ferrule, used too much tension, and could not pull the two rod sections apart—until I cut off the female ferrule wrap.

How do you know you're not using too much thread tension? First, it should certainly not be any more than you use for guide wraps. The best test I know of on ferrules is to first join the rod sections before they are wrapped. Carefully note exactly how far the male section projects into the female section. After wrapping, check to make sure exactly the same length of the male ferrule fits inside the female. If it is any less, you used too much tension. Cut off the wrap and redo it.

So far we have spoken only about the necessity of wrapping all female ferrules. Before we can talk about what to do with the male ferrules we need to place non-metal ferrules into two equally good but structurally different categories: (1) "tip-over-butt" and (2) "spiggot".

The first is made as two separate blank sections with tapers such that the bottom of the tip section fits over the top of the butt section. The spiggot ferrule, on the other hand, is used on a blank that was made in one piece, then cut. A plug with a taper to fit the inside of the blank at the point of the cut is glued into the top of the butt section. This plug can be of solid or hollow construction, and the bottom of the tip section forms a friction lock fit over it. A very important aspect of the spiggot ferrule is that the tip section should not fit down all the way over the plug. On freshwater rods there should be about ¼ to ⅜ inch of the plug showing. On saltwater rods this gap, where the two rod sections do not quite meet, should be ¼ to ½ inch long. The reason for this space, or gap, is to allow for wear.

Most of the wear on either type of non-metal ferrule will occur on the inside of the female section. This was never sanded and/or finished, and has a pebble-like texture. The high spots, or tops of the "pebbles," will wear off in time and the tip section will move lower on either the top of the butt section (in the case of the tip-over-butt ferrule), or over the exposed plug or gap (in the case of the spiggot ferrule). With these facts in mind we can now look at wrapping the male section of a ferrule.

On tip-over-butt ferrules, *do not* wrap the male ferrule. There simply is no need and a wrap serves no constructive purpose. As wear occurs, the tip section has to be free to move down. A wrap on the male ferrule will prevent this necessary wear-in movement, and a loose fit will result. If you are one of those rod builders who feel that a tip-over-butt ferrule looks better cosmetically with a trim wrap, resist the temptation. You're only asking for trouble.

Also for the same reason, make sure you do not locate a guide too close to the end of the butt section.

On spiggot ferrules, space has been allowed for wear-in movement in the exposed plug, or gap. Also, the blank needs hoop-strength reinforcement where the plug is glued inside. Therefore, the male section of a spiggot ferrule should always be wrapped over the same length as the female section.

While on the subject of wear on non-metal ferrules, we should all know how to correct or repair a loose-fitting ferrule. On a tip-over-butt type, file off some of the end of the male ferrule. On a spiggot ferrule, file off some of the bottom end of the female ferrule. In each case, work slowly, constantly checking the fit. You want to remove only enough material to again create a friction lock. Remove too much and you can ruin the ferrule.

As to the color of wraps used on ferrules, there are two schools of thought. One is to match the color of the blank as closely as possible to make the ferrule inconspicuous. Examples would be black on the typical graphite, or regular white "OO" without color sealant to make the thread transparent and allow the blank color to show through. The other approach is to use the same color as that used on the guide wraps.

GUIDE WRAPS

Much of the elaborate and intricate threadwork that is done on custom rods is placed on the butt wrap. There are, however, many opportunities for this decorative craftsmanship on the wraps securing the guides. Quite a few of these were explained and pictured in *Fiberglass Rod Making*. In this section I would like to expand a bit on these techniques in hopes that it will both add to your ideas and encourage you to experiment further on your own. Threadwork is fun, and all of us keep learning from our experiments.

Very narrow trim bands

Very narrow trim bands of a contrasting color look especially handsome on each end of a guide wrap. Their extremely small size adds just a subtle dash of color, and speaks highly of the rod maker's skill with thread. Their proportions are ideally suited to fly rods, light spinning rods, and all small-diameter blanks, but they can be used effectively on rods of all sizes. There are a number of ways of making them. I will detail two methods.

Start by increasing thread tension slightly. Since the wrap is quite narrow, all turns of thread must be placed over the tie-off loop. We'll assume you are wrapping from left to right. Hold the tie-off loop in place on top of the blank with your left thumb and forefinger. Use your right hand to bring a generous length of thread from your tension device over the top of both the tie-off loop and the blank. Temporarily hold it in place by slipping it under the thumb of your left hand. Reach over the top of the blank with your right hand and pick up the loose end of the wrapping thread. Bring it up over the blank and lay it beside the previous wind. Keep tension on the end of this thread with your right hand.

Rotate the blank a quarter-turn. Use your left thumb to push the wrapping thread coming from the tension device over the top of the wind just made. While doing this you were keeping tension on the end of the wrapping thread with your right hand. Now, place your left thumb across the wrap made to this point in order to hold it tight. Once again reach over the top of the blank with your right hand and pick up the loose end of the wrapping thread. As before, bring it up over the blank and lay it beside the previous winds. Keep tension on the wrap by pulling with your right hand.

Repeat the rotation of the blank by a quarter-turn, and again use your left thumb to push the thread coming from the tension device over the wind just made. At this point the wrapping thread is secured to the blank and wrapped over the tie-off loop. Make one complete rotation of the blank so the thread crosses over the loose end a third time.

While keeping tension on the thread coming from the spool, use a *very sharp* razor blade or X-Acto knife to cut the loose end flush with the wrap. The trick here is to hold the blade at 90° against the blank and against the previously made winds. Use a rocking motion of the blade to sever the thread with a clean cut. There should be no end of the thread sticking out from beneath the wrap. You can then rotate the blank the remaining half-turn to the tie-off loop, and complete the wrap in the usual fashion. If, back at the point where you severed the thread with the blade, there was a tiny bit of thread sticking out from beneath the wrap, make one and a half turns instead of just one-half turn. This extra wind of thread should cover the bit of thread projecting from the end of the wrap.

When completing the wrap by pulling the tie-off loop through with your left hand, grasp the narrow trim band on each side with the thumb and index finger of the right hand. This keeps the pulled-under end of the thread in position and prevents the band of thread from coming loose. Before cutting the pulled-under thread, press your right thumbnail against the right edge of the trim band and rotate the blank a couple of times. This will compress the threads and make the trim band even more narrow. Again, hold the trim band tightly with your right thumb and index finger and pull any slack out of the loose thread. Then cut it close to the wrap as usual. You can firm up the wrap by again running your thumbnail around the edge. On very small-diameter tip sections, such as graphite, you might want to immediately "glue" the fragile band together with a coat of color sealant.

Instead of just a single narrow trim band on each end of a guide wrap, they can be used in twos and threes for really fine detailing. Bands in a sequence of white, black, and white look good with most any color guide wrap. Narrow trim bands also can be isolated and not touching any other wrap. These isolated bands can be a short distance from the ends of guide wraps, in front of butt wraps, or as decoration between the foregrip and first guide. The last is a fine way of putting detail on a conservatively wrapped fly rod.

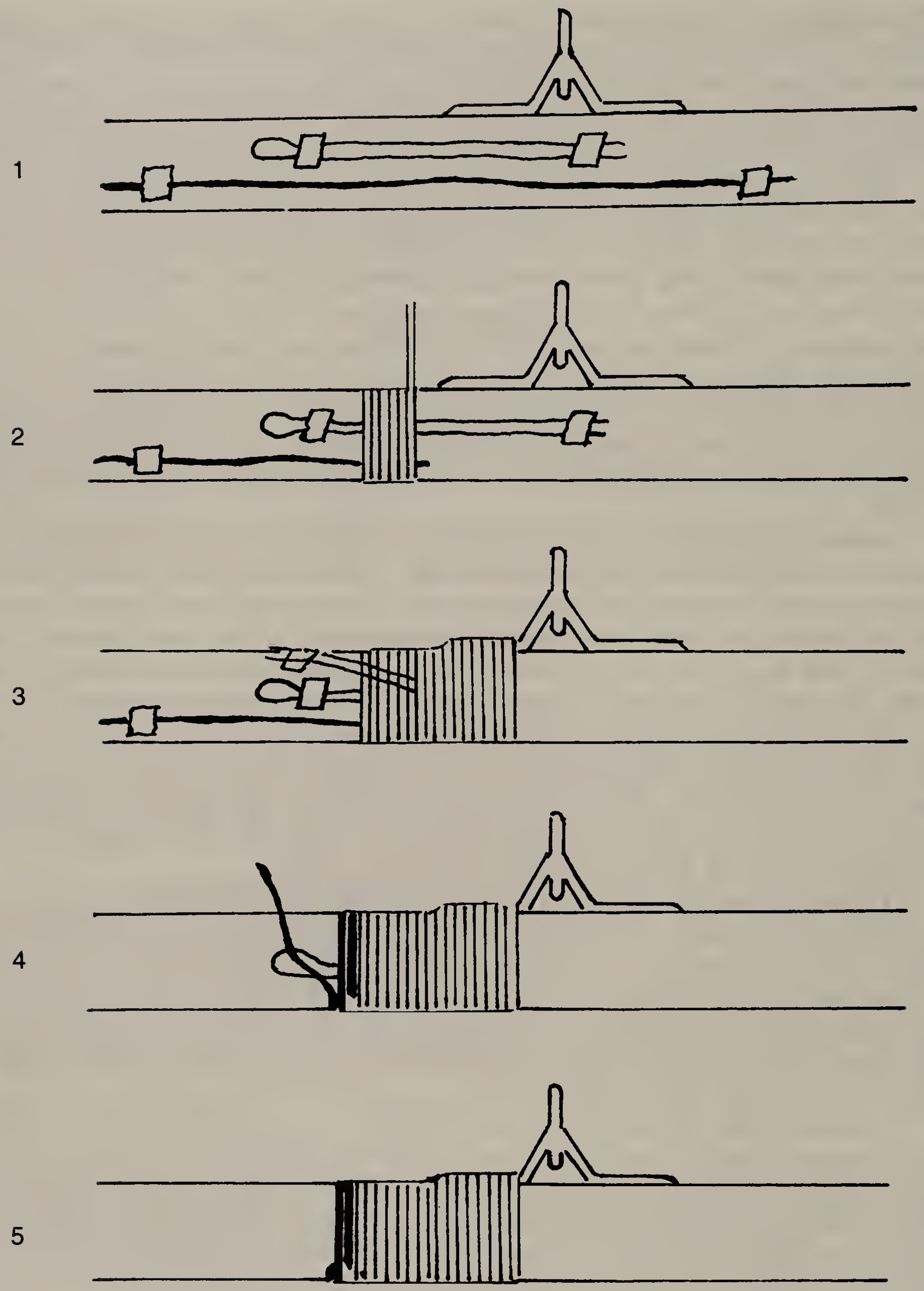
The easiest way of making an isolated narrow band is to first place a strip of masking tape around the blank. The trim band is wound against the edge of the tape just as if the tape were a guide wrap. This provides support while making the fragile wrap and gives you something to press against as you compress the winds with your fingernail. Put a coat of color preserver on the band before removing the tape.

The second method for making very narrow trim bands buries both ends of the thread securely under the guide wrap. It is especially applicable for the very small tip sections of light graphite rods and for any situation in which you want the trim band to be exceptionally narrow, even just a single turn of thread. I first saw it demonstrated years ago at one of our RodCrafter Seminars by Jim Richardson. As Jim pointed out then, the key is to plan ahead and actually lay out the threads to be used by taping them in place on the blank *before you start the guide wrap.*

Assuming that you are wrapping the left foot on a two-footed guide and that you wrap from left to right, you would proced as follows: Take about a 12-inch length of the color thread you will use for the trim band and, using masking tape, tack it to the blank in the area where you will wrap the guide. Hereafter, we'll call this the trim thread. Instead of being centered on the guide, this thread should be more to the left. (See drawing #1.) Also tape your trim-band tie-off loop in the position shown, with the tag ends toward the guide.

Start your guide wrap as you normally would in front of the guide foot. Note that you are wrapping over the top of the trim thread and the trim-band tie-off loop. After about five turns, cut off the right-side end of the trim thread. (See drawing #2.) Do not cut off the tag ends of the trim-band tie-off loop. Instead, untape the ends, fold them out of the way to the left, and tape them to the blank. (See drawing #3.) Continue wrapping the guide wrap and complete it (with a separate tie-off loop) in the usual manner.

After the guide wrap is completed, untape the tag ends of the trim-band tie-off loop and lay them to the right, over top of the guide wrap. Also untape the loop end of this same tie-off loop. Remove the tape from the end of the trim thread and wind it around the



The steps in making very narrow trim bands.

blank and over the tie-off loop. After the desired number of turns, cut the end of the trim thread and insert it in the tie-off loop. (See drawing #4.)

Grasp the ends of the tie-off loop and pull it out, pulling the end of the trim thread with it. As in completing any wrap, trim the tag end as close as possible. (See drawing #5.)

This second method has some advantages over the first. Both ends of the trim thread are firmly anchored under five turns of guide wrap. The band will not unravel before you get to apply color sealant. Also, there are no thread "nubs" on the band. The few minutes of initial layout time will be more than offset by the better appearance of the bands and the fact that none will have to be re-done because they came apart.

Amazing wraps

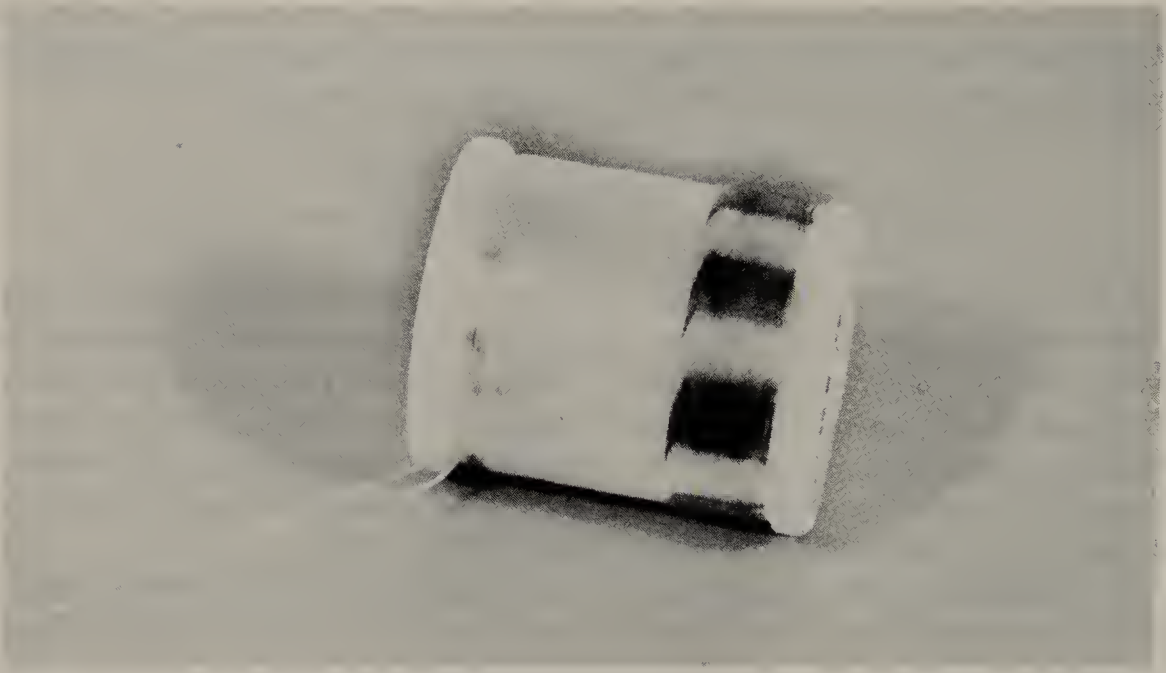
If you are bored with conventional wraps and want to make something that will never be duplicated in a factory rod, let me suggest you experiment with a technique I called "amazing wraps" in a *RodCrafter Journal* article. The idea originally came from RodCrafter Louis Hersh, and quite a few rod builders have added it to their bag of tricks. The technique is quite simple in concept, but extremely broad in the variety of results to be obtained. All that is required to give it a try are some felt-tipped marking pens of permanent ink and an assortment of 100-yard spools of thread.

In a way, you could say that you will be making your own custom "space dyed" thread. Simply make lines or bands of ink across the face of a spool of thread. The width of the bands can be varied, as well as their placement and number around the spool of thread. When the thread is wrapped on the blank it will produce different patterns. A third variable is the diameter of the blank. This is very much of a free-form art as you initially experiment. However, if you keep records of the three variables—(1) the width of the ink lines, (2) the space between lines on the spool of thread, and (3) the diameter of the blank—you will soon be able to control and duplicate your results.

Use of felt-tipped pen to draw lines on thread.

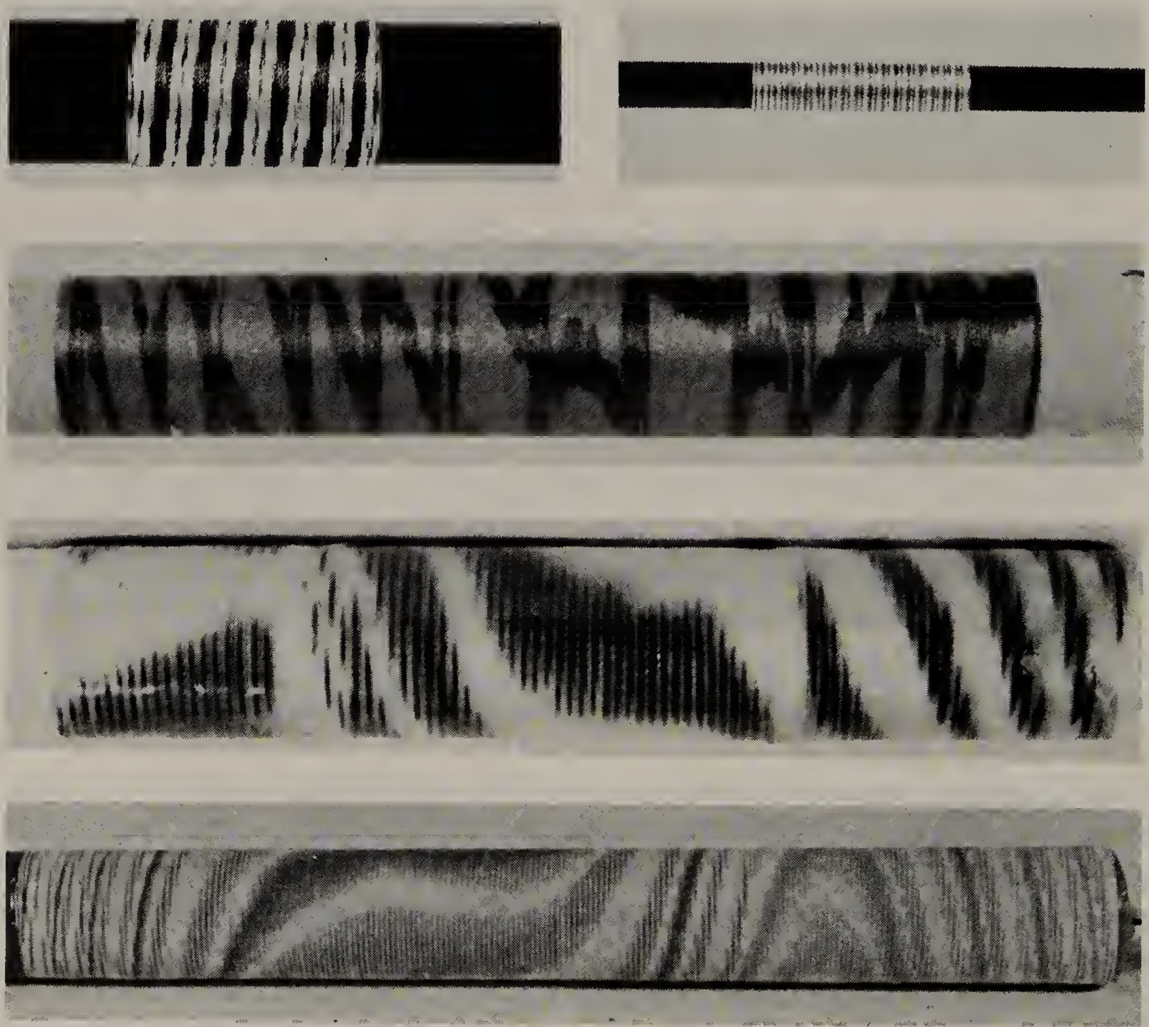
There are some generalities that I'll try to pass along. The ink dries almost instantly, so there is little danger of smudging things. Narrow bands of ink produce narrow lines in the wrap. Broad ink bands produce correspondingly wider lines in the wrap. When the width of the ink bands is held constant they produce comparatively wider bands when wrapped on a small-diameter blank, and narrower bands when wrapped on a large-diameter blank. Usually, the pattern produced in the finished wrap spirals around the blank to various degrees.

The fact that a blank tapers and has various diameters along its length causes a banded spool of thread to produce different patterns at the butt and the tip. These changes



Ink penetrates only one layer of thread.

are progressive and subtle as you move along the rod, and sometimes produce an interesting and desirable effect. If you find the changes objectionable and want to keep the pattern the same as you move from butt to tip, it is relatively easy to adjust your markings on the thread. Just strip off the previously inked thread from the spool and make new bands slightly smaller and slightly closer together.



Sample of "amazing wrap" effects.

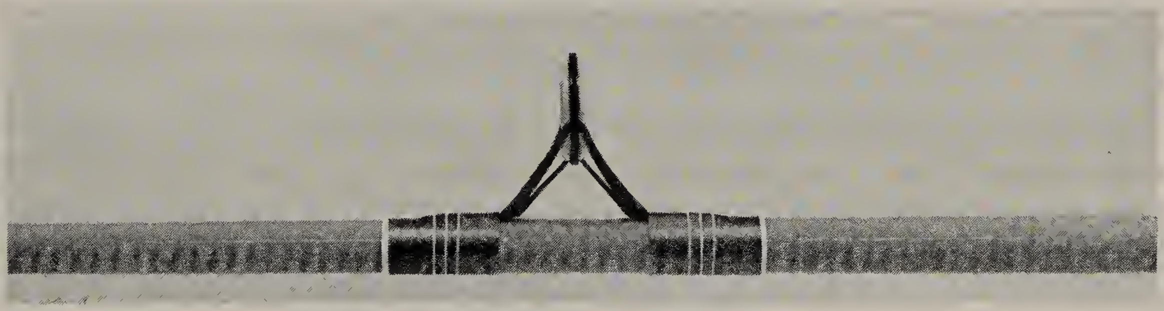
In addition to varying the number of ink markings on the spool and their width, you can vary their placement around the spool. An interesting effect results from alternating wide ink bands with narrow ink lines. The wrap, as you would expect, will have broad bands with narrow lines between. You can make your own custom "tweed," "jasper," or two-tone color combinations by placing many narrow ink lines close together on the spool.

Now that I have broached the subject of color, we have opened the door for still more expressions of your creativity. Felt-tipped pens, both narrow and broad, are available in a huge assortment of permanent ink colors. Combine this with all the thread colors at our disposal, and you begin to get an idea of the possibilities. You can do a great job just using black ink on any color thread. Any dark ink looks good on white thread. Start mixing various inks with different-colored thread and you will be amazed at the rainbow of hues afforded.

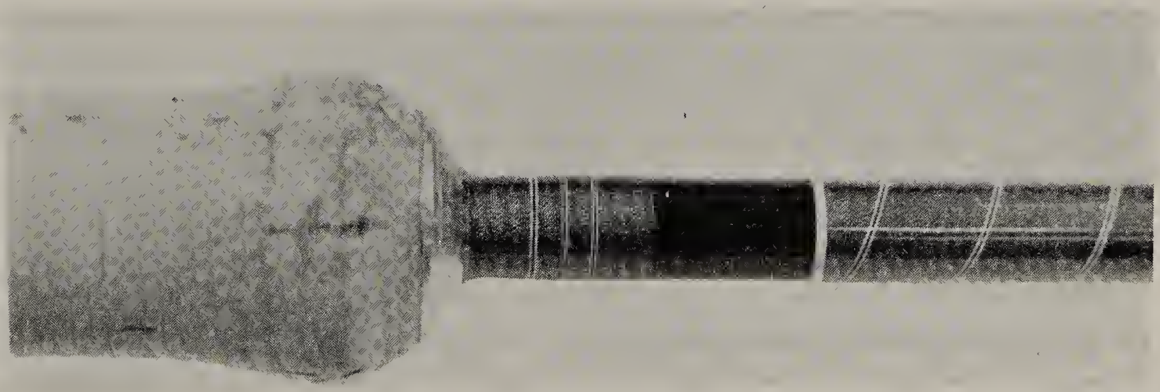
Finishing the wraps should require no different treatment if you used waterproof, permanent inks. As we'll discuss in the chapter on finishing, the preferred color sealants or preservers, like Brillance, are water-soluble. They will not dissolve or lift permanent inks.

Inlaid single wind

A definite aid to communication is established if we can label new things, or give them names. In that spirit, let's call the next wrap we will discuss an inlaid single wind. This is a wrap where one single strand of contrasting-colored thread appears in the midst of a solid wrap of another color. It is a wrap on which I have received many compliments and one which is quite versatile. I usually make three such inlaid single winds, spaced five turns apart, in a guide wrap or a simple hookkeeper wrap. It is equally at home on a brightly decorated rod, or as a distinctive touch on a conservative fly rod.



Inlaid single wind: Single thread spaced five winds apart.



Inlaid single wind:Three threads treated as one, spaced five winds apart on hookkeeper wrap.

The basic technique is to wrap over the end of a single thread so that it is anchored. Then, make a single wind around the blank with the thread. The other end is then wrapped over until it is held in place, trimmed off, and the basic wrap continued. To make three such inlays grouped together, one length of thread is used and it is merely wrapped over between winds two and three.

To start, cut about a 10-12-inch piece of the desired color thread. It should be Size A, the same as the basic wrap into which it will be inlaid. Plan where you want the three winds to be located on the wrap. Make your basic wrap from left to right up to a point about five turns before where the first wind will be located. Rotate the blank on your rod rollers until the back side of the rod is facing up. This is the side *opposite* the side usually seen by the angler as he fishes with the rod. For example, on a fly rod or spinning rod it would be the side of the blank on which the guides are located, since they are on the underside of the rod.

Now take your thread to be inlaid and lay it on top of the blank and along the axis of the blank. Place it so the end is just about up against the basic wrap. Use a small piece of masking tape placed about 1/8 inch from the end of the thread to temporarily hold it in position. Continue making your basic wrap, using a bit more tension than usual, so that it is wound right over the top of the end of the thread for five turns. Remove the masking tape. Keep tension on the wrapping thread coming from the spool, but push the wrapping thread a bit to the right. This provides space for you to inlay the single wind.

Hold the inlaid thread to the left of the main wrapping thread. With your right thumb and forefinger, hold both the inlaid thread and the wrapping thread together under tension as you rotate the blank one single turn. When the inlaid thread has come around the blank to the exact point from where it emerged, hold only the inlaid thread in your right hand. Keep tension on the basic wrapping thread from the spool, but turn the inlaid thread 90° and slip it underneath the wrapping thread. The inlaid thread should now be again parallel with the axis of the blank. Wrap three turns of the basic thread over the inlaid thread. At this point place your left thumb over the point where the inlaid thread completed its journey around the blank and met itself. With your right hand, gently pull the inlaid thread at a slight angle toward you. The object of this is that after two more winds over it, it will be directly in line with the point where the first inlay started. Make those two more winds.

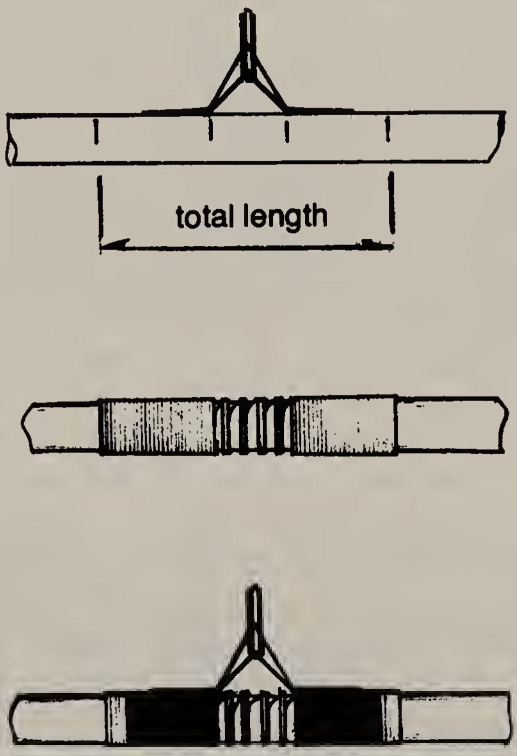
Now repeat exactly the procedure you used for making the first inlaid single wind to make the second. When it has encircled the blank precisely one time, repeat the process of wrapping over it for five turns of the basic wrapping thread. At this point you can repeat the inlaid single wind process for the third wind. When it is completed, pull the inlaid thread under the wrapping thread and wrap over the end for about five turns. Trim the end of the inlaid thread close to the basic wrap and wind over it as you proceed with the wrap.

An area to check carefully as you make the wrap is that the inlaid thread should make precisely only one turn. It must come all the way up to the point where it started, but it must not go past it. Another potential problem area is keeping the points where each inlaid thread starts and stops exactly in line with each other along the axis of the blank. With a little practice you will find the wrap easy to make, and a very rewarding technique to use.

Banded spiral underwrap

An entirely different type of wrap that is eye-catching and distinctive on rods that are underwrapped is the banded spiral underwrap. Again, it is a wrap that demonstrates a high level of craftsmanship and attention to detail on the part of the rod builder. Fundamentally it consists of making a solid underwrap beneath each of the guide feet, but wrapping narrow banded spirals in the open area between the guide feet (under the guide ring). As such it employs both the color of the underwrap thread and that of the blank itself.

To make the wrap follow the procedure outlined earlier for determining the exact length of the underwrap. Using that procedure, you will have three scratches on the blank. One will be in the center and one will be at each end, indicating the start and finish of the underwrap. Before starting the underwrap, hold the guide in position on the blank so that the guide ring is directly over the center scratch. Note where each guide wrap will end at the frame supports for the guide ring. Make an accurate scratch on the blank beneath each of these points.



Banded spiral underwrap.

Start your underwrap in the usual manner at the first scratch and make a solid wrap up to the second scratch—the point where the guide wrap will end. Select the side of the blank on which you want the spiraled thread to show as it connects the bands. Now change your underwrap from solid to open, narrow-banded spirals. To do this, spiral the wrapping thread over the desired space, then make three winds tight together. At the conclusion of the third wind, again spiral the thread over the same amount of space and make three more tightly packed winds. Repeat this process of making narrow-banded spirals across the scratch marking the center of the wrap and up to the next scratch. This indicates the point where the other guide wrap will end. Here, return to making a continuous solid wrap all the way to the last scratch marking the spot where the underwrap ends. Check to make sure all the threads spiraling from band to band are in a line and identical. Adjust any as needed with the point of a thread tool or needle. With the underwrap completed, place the guide carefully in position and tape one foot. Make the guide overwrap in the normal manner.

Multiple-thread wraps

Multiple-thread techniques present the rod maker with a host of opportunities for unique design. This method of simultaneously wrapping two or three threads was explained briefly in *Fiberglass Rod Making,* but can be explored more fully here. In order to wrap up to three threads at the same time you need a thread holder and tension device which will accommodate that number. You will find ideas on this in the chapter on tools. If your present setup will not handle this many spools of thread and you want to try the technique, fall back on the "book method" of providing tension. Place the spools in teacups to keep them from rolling and set the teacups behind a good-sized book. Open the book, lay the thread all the way across the page, then close the book. If more tension is needed place another book or weight on top of the first book.

The basic idea behind combining threads in a wrap is to create an interesting visual effect. When viewed from a distance the wrap will appear to be of a color derived from the blending of the colors used. Black and white would look gray, for example, and yellow and blue would look green. Different shades of color than are normally seen in wrapping thread are thus possible. When using three threads, two can be of the same color in order to emphasize that color in the final shade. For example, two blue and one yellow would produce a blue-green shade. It is just like mixing paint. A white or black thread can be used for the third thread to lighten or darken the final color.

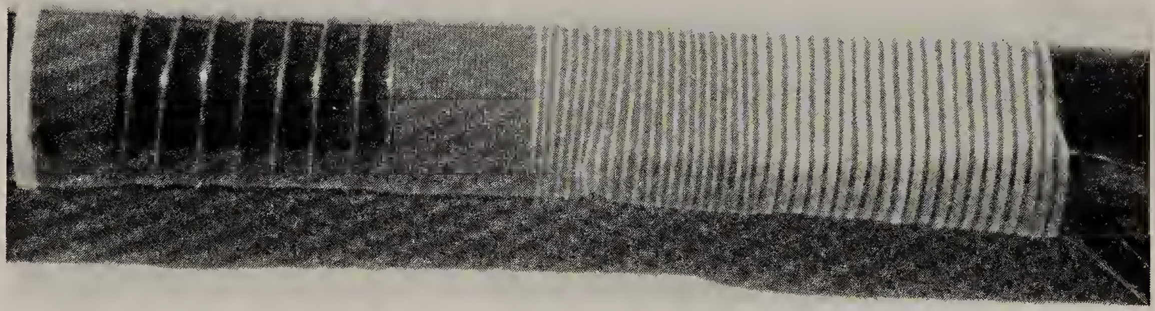
A different effect results when the multiple-thread wrap is viewed at close range. The wrap takes on an almost iridescent quality from the tiny lines of individual thread. From quite close up the intricate nature of the work is apparent and immediately distinguishes it as being custom. Many rod builders who use this technique prefer Size D thread, since the separation of the colors is a bit more pronounced. Combinations of Size A thread will blend the colors more when viewed from moderate distances. A lot depends on the individual colors selected, but I have found that Size A often works well with three colors. Then, two of the three can be the same color, or black or white can be employed as the third thread. This aids in separating the colors, if that is desired. Some experimental test wraps will help you achieve the effect you want. Vary not only the colors of the threads used, but their sequence as well. Trim bands at the end of a wrap most often look best if made of one of the colors used in the mixture. They are quite easily made as part of the wrap. Start the wrap a bit farther from the leading edge of the guide foot. First wrap just the single colored thread you want for the trim band. After the desired number of turns, add the second thread by looping it singly over the blank for one turn, then winding both threads over the loose end. From there, just continue wrapping both threads together.

This process of adding a second thread (or two threads at once) is the key to mastering the multiple-thread technique. It may therefore be helpful to describe in detail the step-by-step process I use. Let's assume we are wrapping from left to right and the colors are black and white. We'll further assume the trim band is to be black. Start the black thread by wrapping it over itself and wind on five turns. Do not trim off the loose end of wrapped-over thread.

Holding the rod on your rollers with your left hand, rotate it so that the loose end is directly on top. Take the white thread in your right hand, place it over the top of the rod and alongside of the last black thread. Bring the white thread down over the front of the rod. Just move your left thumb over and clamp the white thread to the front of the rod, allowing the end to hang loosely. With your right hand, reach over the top of the rod and pick up the end of the white thread. Bring it up around the back, across the top, then down in front. Keep tension on the white thread with your right hand. (At this point the white thread has completely encircled the rod.)

You can now release the clamping pressure of your left thumb, since your right hand is pulling the white thread tight. Shift your left index finger to the right, and use it to push both black and white threads together over the top of the previous turn of white thread. This starts to lock the white thread in place. To keep the threads from slipping, place your left thumb over the threads where they crossed the white thread. Use your right hand to rotate the rod one-half turn—all the while keeping your left thumb in place holding the threads. After one-half turn, press your right thumb on top of the threads on top of the rod to hold them. Use your left hand to rotate the rod another one-half turn until the black and white threads together cross the loose end of the white thread for the second time. This locks the white thread in place. You can trim the ends of both black and white threads and continue wrapping with both threads together.

I said this process of adding a different-colored thread to a wrap in progress is the key to the multiple-thread technique. Let's examine just a few of the things that can be done with it. We can make a guide wrap that will change shade, or depth of color, over its length. This is a style sometimes used by RodCrafter Vaughn Corbridge. Let's suppose we want a wrap that will start as light blue and get darker in three stages as it progresses toward the guide ring. The first one-third of the wrap would be made of light-blue thread. Then a dark-blue thread would be added and the two threads wrapped together for the middle third of the wrap. A black thread would be added last and all three threads wrapped simultaneously to the end. There they would be inserted in a single tie-off loop and pulled under.



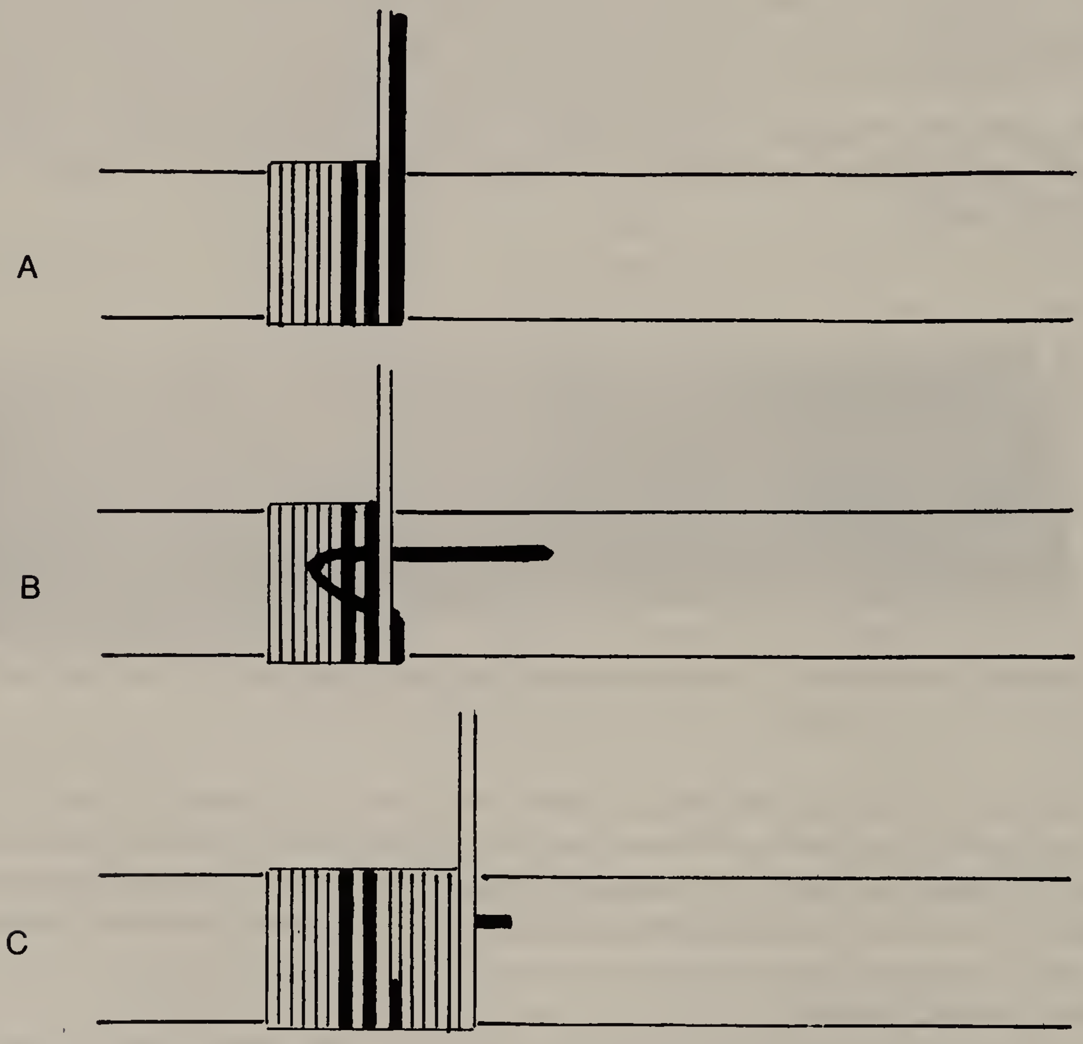
Multiple thread wrap. Single dark color for open spiral and first section of wrap; medium color added for middle; white added for last section.

The above wrap was described in thirds for an even progression of color. It could just as easily have been made in different proportions for a more rapid change of color at one end or the other. The colors used can each be quite different for dramatic, bold changes in shades. An example would be white, red, and black. Or, the colors can be quite similar for subtle, more subdued shifts in color. An example of this approach would be beige, brown, and dark brown.

So far we have only talked about adding colors as the wrap is made. Colors can also be dropped out of the pattern. This would enable you to make a wrap in reverse of the earlier example. It would then progress from dark blue, to medium blue, to light blue, as it moved toward the guide ring. We would start all three threads together—black, dark blue, light blue—in that sequence from left to right. First the black would be dropped, then the dark blue, and the wrap would be finished in light blue only.

To drop a thread, plan the arrangement of threads coming from the spools so that the thread to be dropped will be on your left. Let's suppose we are wrapping black and white together and we want to drop the black. Use your left thumb to clamp the threads in place against the rod. With your right hand reach up and cut the black thread about four inches above the rod, and pull the end to the right and under the white thread. Rotate the blank so the white thread lies over the top of the loose black end. A couple of more turns will lock it securely, and you can trim the end.

You can also drop the thread that is on the right of a pair of threads. For example, let's say we have a tan thread on the right and a brown thread on the left, both being wrapped together. To drop the tan thread, cut it about four inches from the blank while keeping tension on the brown thread. Pull the tan thread to the left and rotate the blank just far enough for the brown thread to cross over the tan. While holding everythig in that position, pass the end of the tan thread back to the right. Don't pull it all the way across—just leave a small loop. Rotate the blank so that the brown thread crosses and locks down the tan thread that passes from the loop on the left to the right. After a couple of revolutions and turns of the brown thread, carefully pull on the cut end of the tan thread until the loop disappears, then stop.

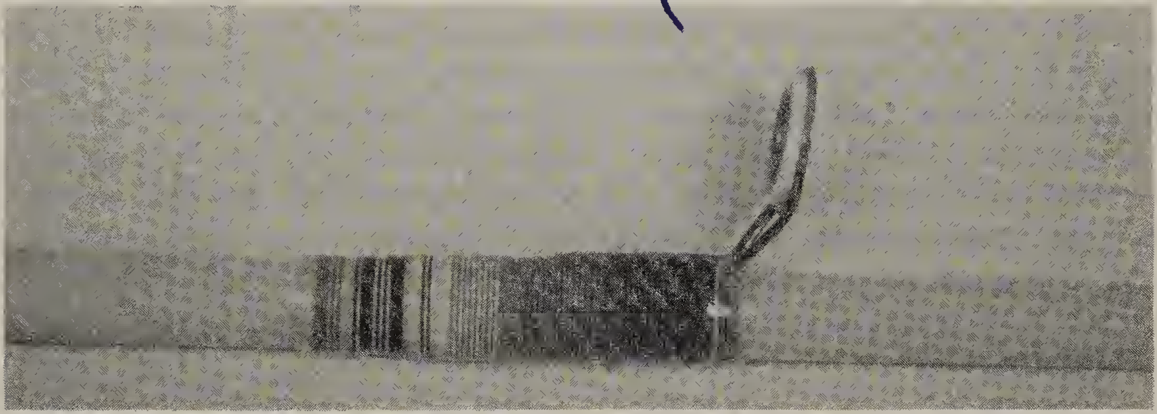


To drop the dark thread on the right (A), loop it first to the left, then back to the right (B). After a few turns, pull the loop out carefully (C) and cut the tag end.

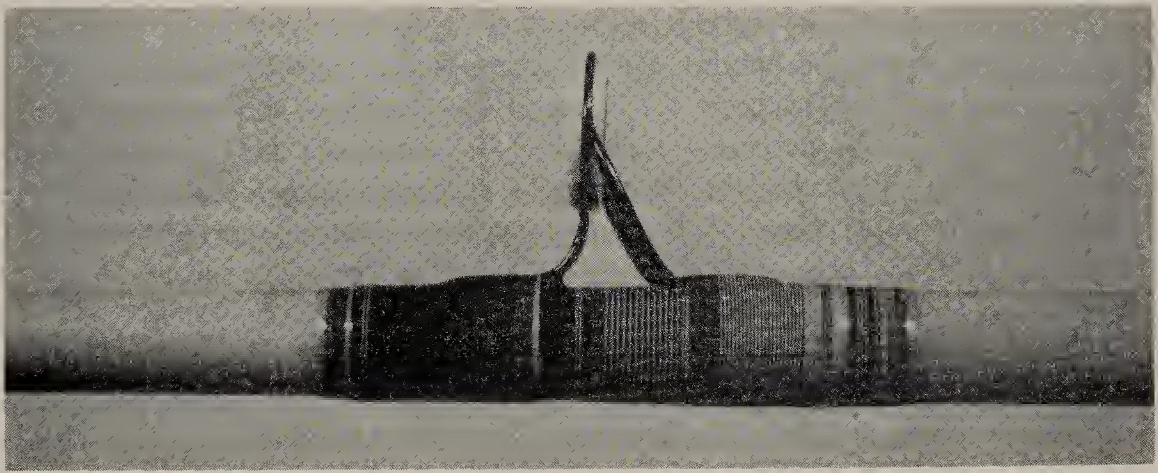
It helps if you put your left thumb over the loop as you pull the tan thread. In this way you can make sure you do not pull out too much of the tan thread. Cut it close to the blank. The beginning and ending of all "adds" and "drops" should be aligned on the opposite side of the blank, as seen from the angler's position.

Being able to add or drop threads at any point increases the variations possible. We could make a wrap that starts light, gets darker in stages, then in reverse order gets lighter and returns to the original color. Naturally we are not limited to combinations of thread color that simply appear to get lighter or darker. We can also change the basic color itself. For example, from yellow to green (yellow and blue) to blue-green (yellow, blue, and blue) to green (yellow and blue) to yellow.

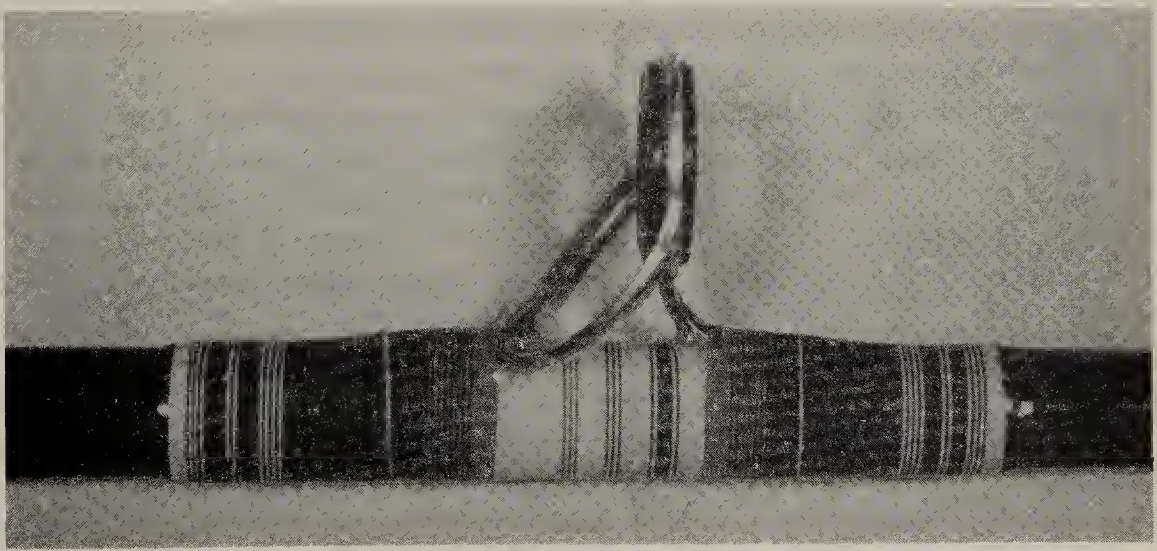
One or two narrow bands of color can be inserted in a wrap by the same technique. Make the wrap almost entirely of one base color. At the point you want the narrow band,



Examples of multiple-thread guide wraps.



Examples of multiple-thread guide wraps.



Examples of multiple-thread guide wraps.

add the second color. Drop it after the desired width of the band is made, and continue with the wrap in the base color. I think by this time you can see that there are an almost infinite number of variations of colors and patterns possible by using the multiple-thread technique.

The only other specific suggestions I can make which may be of help are as follows. When wrapping two or three threads at one time it helps to rotate the rod with your left hand. Place your right thumb and index finger about 2 inches above the rod and grasp the threads coming from the spools. This enables you to keep the threads in the proper sequence, adjust the tension, and lay the threads tightly against the previous winds. It also will help you to keep one of the threads from slipping between previously wound threads. When ending the wrap use a length of strong thread (or mono) as a single tie-off loop. Cut the threads and insert them in the loop. Before pulling the tie-off loop under, make sure the threads are still in the same sequence. After the tie-off loop has been pulled out, pull each thread tight, and trim it individually. Next, check the edge of the wrap where the threads were pulled under. It probably will be indented from the pressure of pulling the threads tight before trimming. Use a thread tool, burnisher, or your fingernail to carefully push the edge of the wrap out so that it is straight. In the process you will probably pull the trimmed ends under, eliminating any nubs in the finished wrap.

WRAPPING ONE-FOOT GUIDES

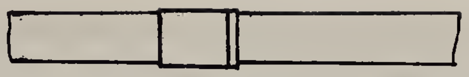
As mentioned earlier, the single-foot guides are among the most versatile, and some wrapping suggestions may be helpful. Perhaps the place to start is with what not to do. Since these guides are used to allow the blank to flex as freely as possible and to add a minimum of weight, do not underwrap them. Also, do not attach the feet to the blank with Super Glue. It will be almost impossible to get the guides aligned in this manner. To do so would take far too much time. If they are wrapped under the proper tension, final adjustments can be made by moving the guides slightly as discussed earlier. Super Glue is permanent, and a mistake once made cannot be corrected.

To hold the guide in place for wrapping, use short pieces of the micro surgical tubing that we called Guide Placement Aid in the chapter on guides. I find that a piece about the length of the guide foot is ideal for test casting and stress-distribution testing. When I'm ready to wrap, I roll the tubing up over itself so that it is about half its original length or smaller. This is placed in about the middle of the guide foot, and I wrap up the blank and over the leading edge of the foot. When I get to the point where the roll of tubing is in the way, I just roll it farther along on the foot toward the guide ring. When I'm certain the guide is anchored in place, I slice or snip the tubing away.

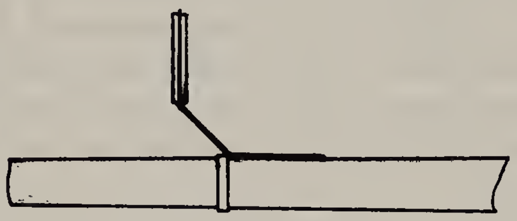
Another method for holding the guide is narrow masking tape. The 1/4-inch size works well. Place one strip over the foot as close to the ring as posible. Place another strip near the other end but leave the leading edge of the foot free so it can be wound over before removing this piece of tape. I have also used wide strips of tape and peeled them back as I wrapped up the foot. When well anchored, the remainder of the tape is carefully peeled off.

A single or double trim band is easily placed on the end of the guide foot in the usual manner. Matching trim bands can also be placed at the guide-ring end. The only catch is that they must be put on the blank before the guide is wrapped in place. This requires a little planning.

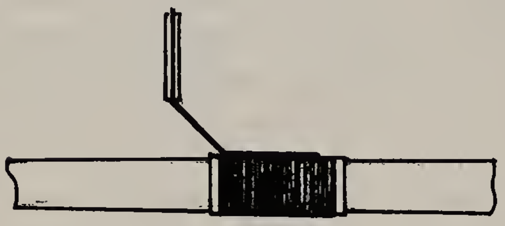
First mark the position of the guide ring with a faint scratch from a scriber on the surface finish of the blank. From this mark *toward the tip,* measure the distance that will



masking tape stop—trim band wrapped



position guide



completed wrap

Trim bands on both ends of single foot guide.

be occupied by your trim wrap or wraps. Make another faint scratch. Next to this second scratch wrap a small piece of masking tape all the way around the blank. It can be two layers thick if you prefer. This will be the temporary "wall" or "stop" against which you will start your trim wrap.

Place the blank (without the guide) with the tape to your left. Hold your tie-off loop in place (with the open ends to your left), and start your trim wrap directly over the loop, and against the tape. After three or four turns, when the wrapping thread is secure, cut off the excess end of the thread as close as possible. Complete the trim band with the desired number of turns and insert the end as usual into the tie-off loop. If a second trim band is planned, just duplicate the procedure to the right of, and against, the first trim band. If you feel these bands of thread are fragile—as they may well be at the tip end of the blank—set them with a single coat of color preserver, temporarily leaving the tape in position for protection.

To position the guide for wrapping, slide it along the blank until it is against the trim band. The guide ring will actually slide up over the trim band. This is necessary because of the design of the angled support from the flat foot to the guide ring. The end of the wrap closest to the guide ring must be against the trim band, with no space between. If a space does result, you know you did not move the guide ring far enough up over the trim band.

WRAPPING ROLLER GUIDES

Offshore trolling rods are built on strong, thick-walled blanks for fighting powerful fish. The comparatively heavy feet of roller guides must be attached securely. This is one situation where an underwrap is required. It provides a nonslip base on which the guide feet rest and helps resist any twisting force that may push the guides out of alignment.

There was a time when extra-heavy thread was thought to be necessary. Sizes E, EE, and FF were used. This may have arisen in part from the use of silk thread, which was weaker and would rot in time if not adequately protected. Today's strong, rotproof nylon thread in Size D is more than adequate for the job, especially when combined with our modern wrapping finishes. The improved appearance of the wraps made with Size D thread is quite obvious and much more desirable. Some people do not realize it, but we can apply more wrapping pressure (and apply it much more evenly) with size D than we could with size E or heavier thread. This is because we can wrap more turns of thread per inch.

Another old custom was to wrap two layers of thread on top of the guide feet. This was in addition to the underwrap. Some people called it "double-wrapped" and others used the term "triple-wrapped." This originated many years ago when the only finish was varnish. In time, the varnish would crack and chip, but it was especially vulnerable to damage by abrasion. Since the finish provided very little real protection, a second entirely separate wrap was made on top of the first guide wrap. People figured that if one layer came loose in a fight with a fish, there was a second "insurance" layer beneath it.

I raise this issue because with our present nylon thread and most especially our modern epoxy and high-build polymer wrapping finishes, a double or triple wrap is entirely unnecessary. It would take a tremendous amount of abrasion to wear through the finish and even get at the thread. If the color sealant and finish were properly applied, you could abrade half of it away and the other half would still hold the guide in place. Nevertheless, rod builders still encounter fishermen who think that extra wrap is necessary. Try to educate them, but if that fails, wrap the second layer. Make things easier for yourself, however, by color-sealing and finishing (one coat) the bottom layer of thread before wrapping the second layer of thread on top.

The size of the thread used for the underwrap is not important as far as the strength of the wrap is concerned. Its function as a cushion to protect the blank is minimal. One look at the heavy wall thickness of these blanks will prove this. As noted earlier, its job is to provide a textured gripping surface for the underside of the guide feet. Size A thread meets these requirements and makes a better surface on which to wrap a Size D guide wrap. It also looks better than heavier thread on the exposed portions of the underwrap.

To make the underwraps follow the same technique described earlier in this chapter for layout. There is one difference in the usual wrapping pattern on an offshore trolling rod. The underwrap for the decorative butt wrap often extends all the way to the butt guide, where it also serves as the underwrap for that guide wrap. With long underwraps on a rather large-diameter blank, hand work gets rather tedious and boring. For this reason, rod builders who make more than the occasional rod of this type use power wrapping equipment for the underwraps.

As a general rule, trolling rods tend to be brighter and more decorated than other rods. The larger diameter of the blank and the larger roller-guide frames lend themselves to more intricate wraps. The underwrap automatically introduces a different color than the blank, and one around which the color scheme can be designed. For example, most guide wraps have at least one trim band of color beneath the center of the guide and over the underwrap. Often there are three bands of color, the two on the ends being different from the one in the middle. Naturally, such trim bands must be made before the guide is wrapped in place. If three bands of color are used, they can each be wrapped individually, or one longer band can be made with a narrow band overwrapped in the center. The rod builder who enjoys threadwork and color design will find offshore trolling rods a joy to wrap.

DECORATIVE BUTT WRAPS

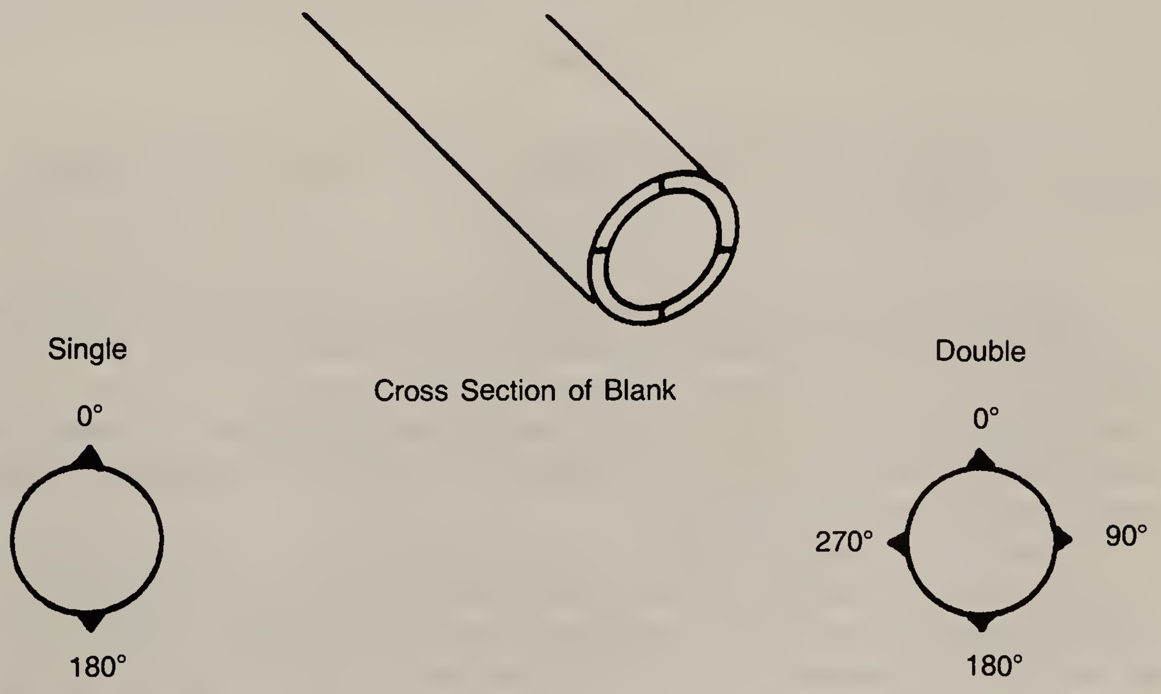
It seems safe to say that the majority of custom rod builders enjoy making intricate decorative butt wraps. Some work with a number of bright, bold colors and patterns, while their more conservative brethren prefer fewer, muted colors and more delicate versions of essentially the same patterns. However, it has been my experience from holding seminars and speaking to groups all across the country that some of the greatest interest lies in threadwork—particularly at the butt end of the rod.

Butt wraps can become incredibly complex, both to make and to explain to another rod builder. Once a person understands the basic principles and techniques, he can develop and evolve his own unique wraps. I therefore feel that the most helpful and instructive approach we can take here is to first confine our discussion to the concepts and fundamentals common to making intricate wraps. We can then cover some specific wraps as examples of technique and to spark your own creativity.

CROSS WRAPS

It will help if we define a few terms. Diamond, chevron, and many other wraps, whether single or double, all have one thing in common: They are built around a series of crosses formed by thread spiraled up and down the blank. Many of the techniques used are the same. Therefore, let's give this family of wraps a name and call them "cross wraps."

Single cross wraps have crosses on only two sides of the rod, top and bottom (as viewed by the angler when fishing the rod). These could also be called the 0° axis and the 180° axis. Double cross wraps have crosses on four sides of the rod—the top, right side, bottom, and left side. We could also refer to these positions as the 0°, 90°, 180°, and 270° axes. Cross wraps can be made on more sides, or axes, but since the same principles apply to them that apply to double cross wraps, we'll use only those two terms.

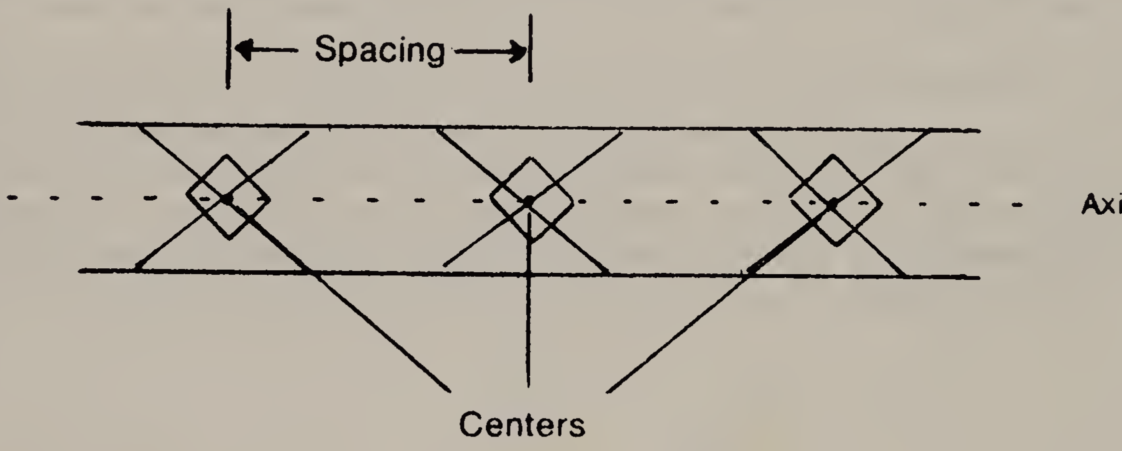


Single cross wraps: 0° and 180°. Double wraps: 0°, 90°, 180°, and 270°.

Cross wraps can be made by spiraling a length of thread up the blank, then turning the same thread around and spiraling it back down. The threads forming the wrap are bound down with a base wrap only at the bottom. Cross wraps can also be made so that there are two base wraps binding down the threads, one at the top of the wrap and one at the bottom.

It is strongly suggested that all cross wraps be made this way, with the two base wraps. About the only wraps that can be made with just one base wrap are the very simple patterns, and even they present their share of difficulties at the point where the wrapping direction is reversed. As soon as you introduce any complexity to the pattern, you must use a base wrap at each end to make it workable. It is therefore easier in the long run to form the habit of making all cross wraps with two base wraps.

Any of the cross-wrap patterns can be wrapped directly onto the bare blank or over an underwrap. Some beginning rod builders find it easier to wrap over an underwrap since the friction between the underwrap and the wrap being applied helps hold the threads in position as they are wrapped. As the pattern gets more complex, this same friction works against the rod builder since it is more difficult to slide threads to make slight adjustments—and slide threads you must. My own suggestion would be to use an underwrap only when you definitely want a different background color than that of the blank, and then only if the pattern is relatively simple. Keep in mind that the underwrap also adds bulk to the wrap, which may look out of place on a small-diameter blank.



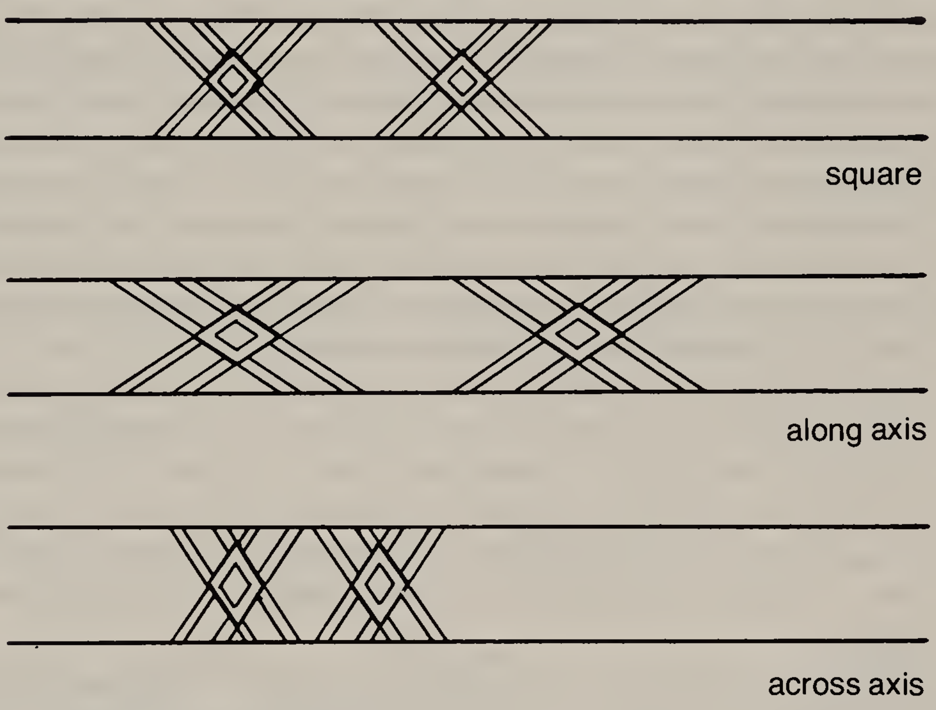
The "center" is where the initial crosses of thread form. The "spacing" is the distance between the centers.

One of the key parts of the preplanned layout for any cross wrap is the space between the crosses formed when a thread is spiralled up and down the blank. It is around these crosses that the different patterns are formed. In most cases, the cross becomes the center of the pattern—and that term "center" is used to indicate the cross formed by the initial spiralled threads. *The space or distance between centers, then, is the distance between the points where the crosses will form.*

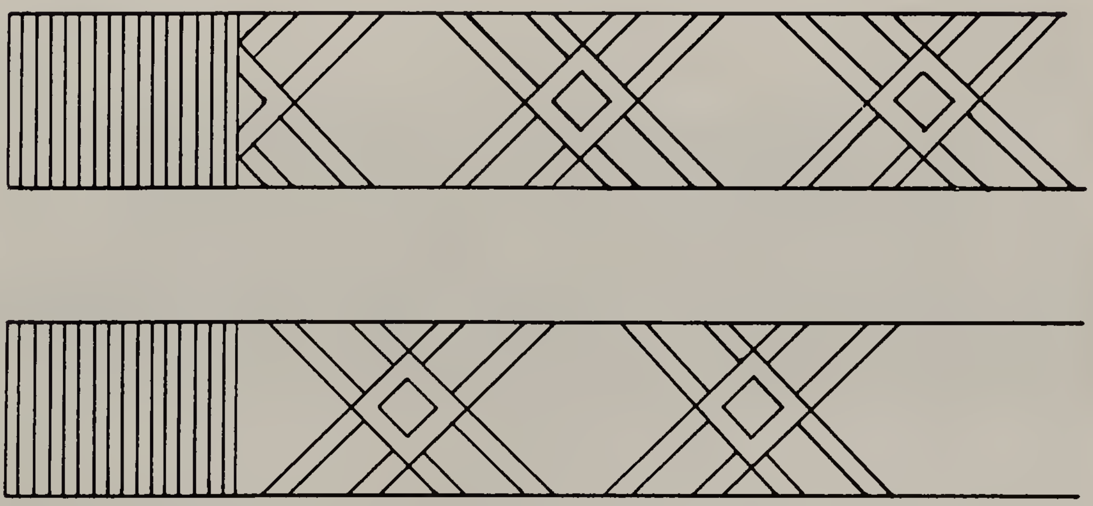
Whenever you want the threads forming the crosses to be at right angles to each other, or square, the distance between centers will be the blank's circumference (at the middle of the wrap). This is for a single cross wrap where there are crosses on the 0° (top) axis and the 180° (bottom) axis. For a double cross wrap with crosses on the 0°, 90°, 180°, and 270° axes, the space between centers for a square pattern will be one half the circumference. This is important, so let's review it:

Single	*Double*
crosses at 0°-180°	crosses at 0°-90°-180°-270°
space between centers: circumference	space between centers: ½ circumference

You won't necessarily want to make all of your patterns square with the threads crossing at 90° to each other, but most will look best made that way. If you use a greater distance between centers, the pattern will elongate *along the axis* of the blank. If you use a shorter measurement the pattern will elongate *across the axis*. This is a valuable control that you have to make the patterns just the way you want them. You will find that if you enjoy thread art and progress to more intricate patterns, they will almost always be wrapped square for symmetry and balance.



Spacing between crosses determines shape.



Above: Basewrap across center of crosses.
Below: Base wrap between center of crosses.

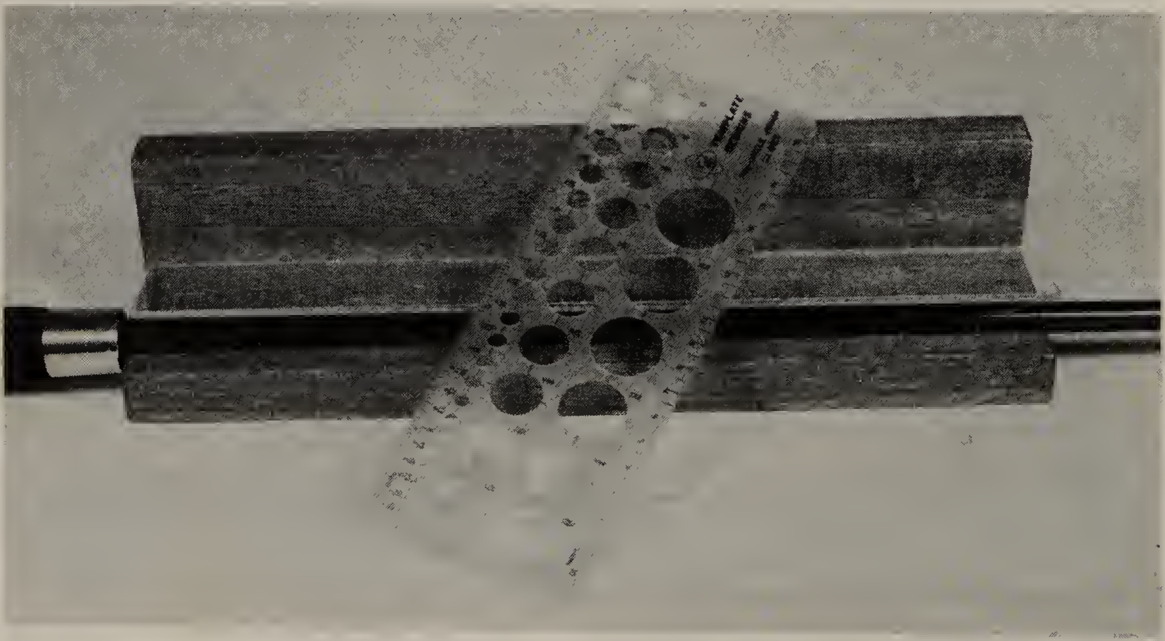
Another option you have when planning a cross wrap is here, on the pattern, to locate the inner edge of the base wrap binding down the threads. The usual position is to start the base wrap right across the center of one of the crosses. While this is neat and symmetrical in appearance, it does place the base wrap over the thickest, bulkiest part of the pattern—making the base wrap itself bulkier. For this reason some craftsmen prefer to locate the base wrap between two crosses. Once again, you must make this decision before planning your layout.

Layout for cross wraps

The quality and visual appeal of any cross wrap is based on a number of criteria. The first is how straight along the axis of the blank the crosses lie. They obviously should not angle off to either side. The second criterion is how accurate the space between each cross is. It should be exactly the same throughout. The third area of evaluation is how accurately around the blank the lines of crosses are placed. On a single wrap they should be precisely on top and bottom, or 0° and 180°. On double wraps each line of crosses should be one-quarter of the circumference, or 0°, 90°, 180°, and 270°. If any of these criteria are not met, the wrap looks out of balance, the shape of some of the patterns will be different, and workmanship is judged to be sloppy. If time is spent beforehand in careful layout, making the wrap itself will be simplified and the results will be outstanding. The layout, then, is just as important as the actual threadwork.

Beyond a doubt, the best and fastest method I have found for making the layout is to use the Butt Wrap Alignment Tool developed by RodCrafter Don Dewey. Since we entered an exclusive agreement years ago to manufacture these, we have sold thousands, and everyone who used the tool has been delighted. Many other RodCrafters have made their own from Don's instructions in the *RodCrafters Journal* and we've listed it in this book in the chapter on tools. The tool consists of (1) a circle template, (2) an alignment board, and (3) a top plate.

After the handle is completed on the rod, but before the guides or tip-tops are installed, the circle template is used to locate the two or four axes on which the wrap will be made. Select a hole size in the template that will fit snugly around the blank a few



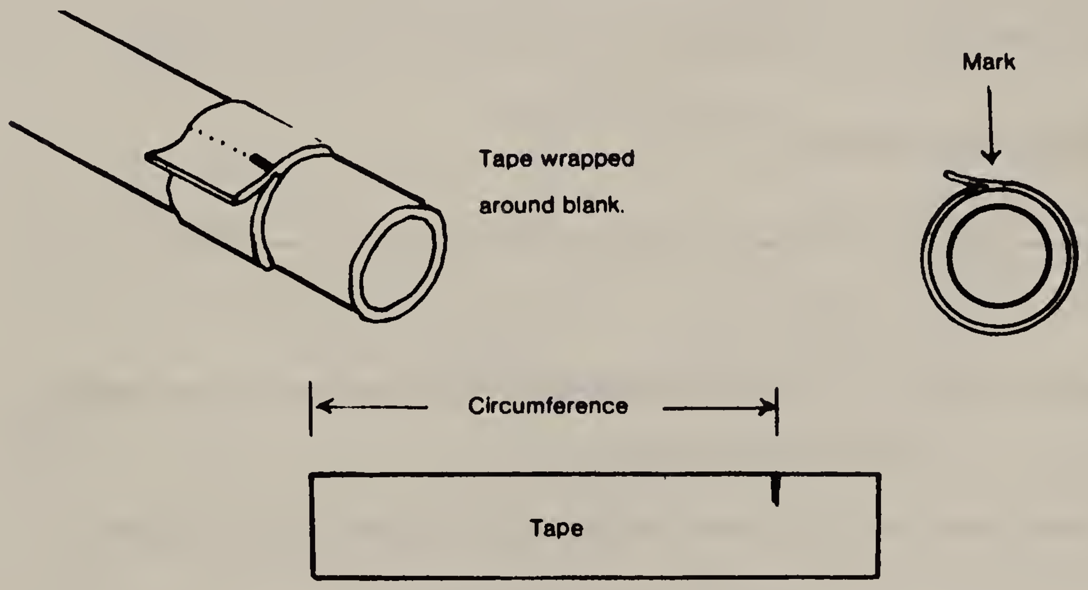
Butt Wrap Alignment Tool.

inches above the foregrip. Slide the template down the blank until it fits tightly. Rotate the template until one of the four marks around the circle cut-out is aligned exactly with the previously located spine of the blank.

Make sure the template does not move (that's why you want a snug fit). Use a scribe to carefully make a small mark in the finish of the blank next to the two (single pattern) or four (double pattern) circle template marks. These marks will be used for the axes of your wrap. Since I am not always sure whether I'll use a single or double pattern wrap, I generally mark all four axes. Later, if I need them, they are marked. For the moment you can forget the marks and proceed with wrapping the guides on the blank.

At this point, it will help if we make some assumptions so that we can follow the steps in the layout process. Let's start with something with which we are all familiar—a single diamond wrap. We will further assume that you want the pattern to be square, with the spiralled threads crossing at a 90° angle.

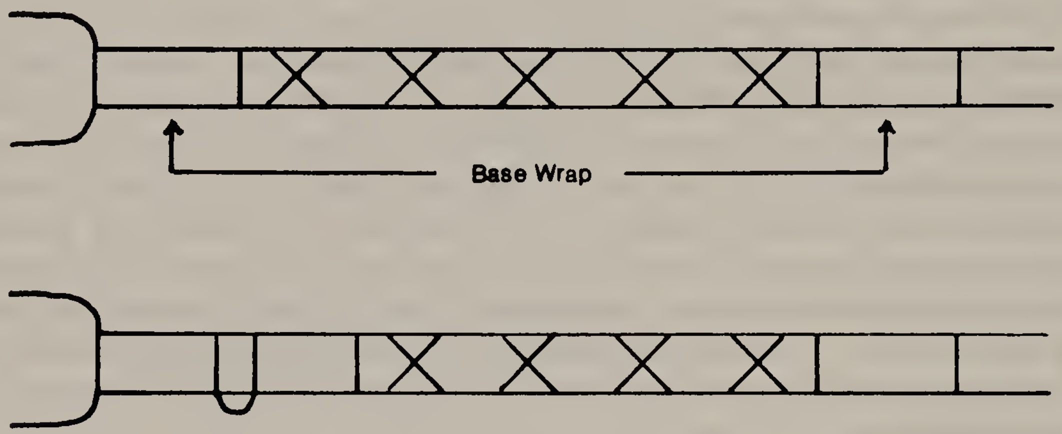
The first step is to determine the length of your wrap. Initially, just make a rough estimate according to what looks good to you, and put your finger on the middle. It is at this spot that we need to determine the circumference of the blank since that will be our space between the centers of the crosses. We could measure the diameter with a pair of calipers and multiply by 3.14, but here is an easier way. Cut one end of a piece of masking tape so it is resonably straight. Attach the tape to the middle of the estimated wrap, where you placed your finger. Wrap the tape around the blank slightly more than one full turn. Mark the point on the tape where it starts to make a second revolution, as shown in the drawings. You have just marked the circumference, the distance around the blank. Carefully peel the marked tape from the blank and place it flat on your benchtop for future reference.



To determine the circumference of the blank, wrap a piece of masking tape around it. Mark the tape, then peel it off.

You made an initial rough estimate for the length of your wrap. Now you can get specific. How many repeats of the diamond pattern (space between centers) will fit in your rough length. For example, if the circumference measured 44 millimeters and your initial rough estimate was 200 mm, then four repeats would be 4×44=176mm. Five would be 5×44=220mm, and since that is closer to our original 200 mm we decide to use it (220mm) for the length of the wrap.

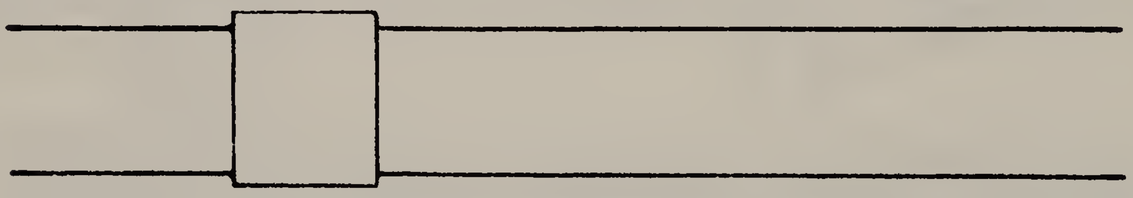
You can now physically lay out the length of the wrap on the blank. Be sure to allow for the space at each end for the base or tie-down wraps. Also, if you intend to use a hookkeeper, plan the space for it. For example, let's suppose we decide to make each of our base wraps 20mm. However, we plan on incorporating a hookkeeper which we figure will add an extra 20mm to the base wrap at the butt end. We therefore measure 40mm from the edge of the foregrip and make a tiny scratch on the blank. Repeat this a number of times around the blank. Next, carefully wrap a strip of masking tape around the blank so that one edge just touches each of your marks. After the first wind is complete, make two more winds directly on top, keeping the edges perfectly aligned. Now use the band of masking tape as a template to lightly scribe or draw a circle around the blank. When completed, peel off the tape. This technique is useful whenever you want a circle around the blank.



Hookkeeper and Base Wrap combined.

When planning the layout, you must allow for the hookkeeper if one is to be used.

Scribing circle around blank.



Masking tape template.

To scribe a circle around the blank, make a template of a few layers of masking tape.

The circle you just made marks the inner edge of the base wrap at the butt end of the wrap. From there toward the tip, measure 220mm to the inner edge of the base wrap at the tip end of the wrap. The base wrap itself is another 20mm. That point is the outer edge of the base wrap. When taping our spiraled threads temporarily to the blank we want to be certain we do so beyond that outer edge of the base wrap. I mark each of these points, usually with a lightly scribed circle.

If you did not mark the 0° and 180° axes before you wrapped on your guides, here is a method I learned from RodCrafter Raymond Walker with which you can still locate them. Wrap a piece of masking tape around the blank at each end of the proposed wrap area. Right next to each of those pieces, wrap another piece on the outboard side. Use the guides to sight the 0° and mark it on one of the pieces of tape. Lay the blank in the Butt Wrap Alignment Tool and place a mark across all four pieces of tape on the 0° axis.

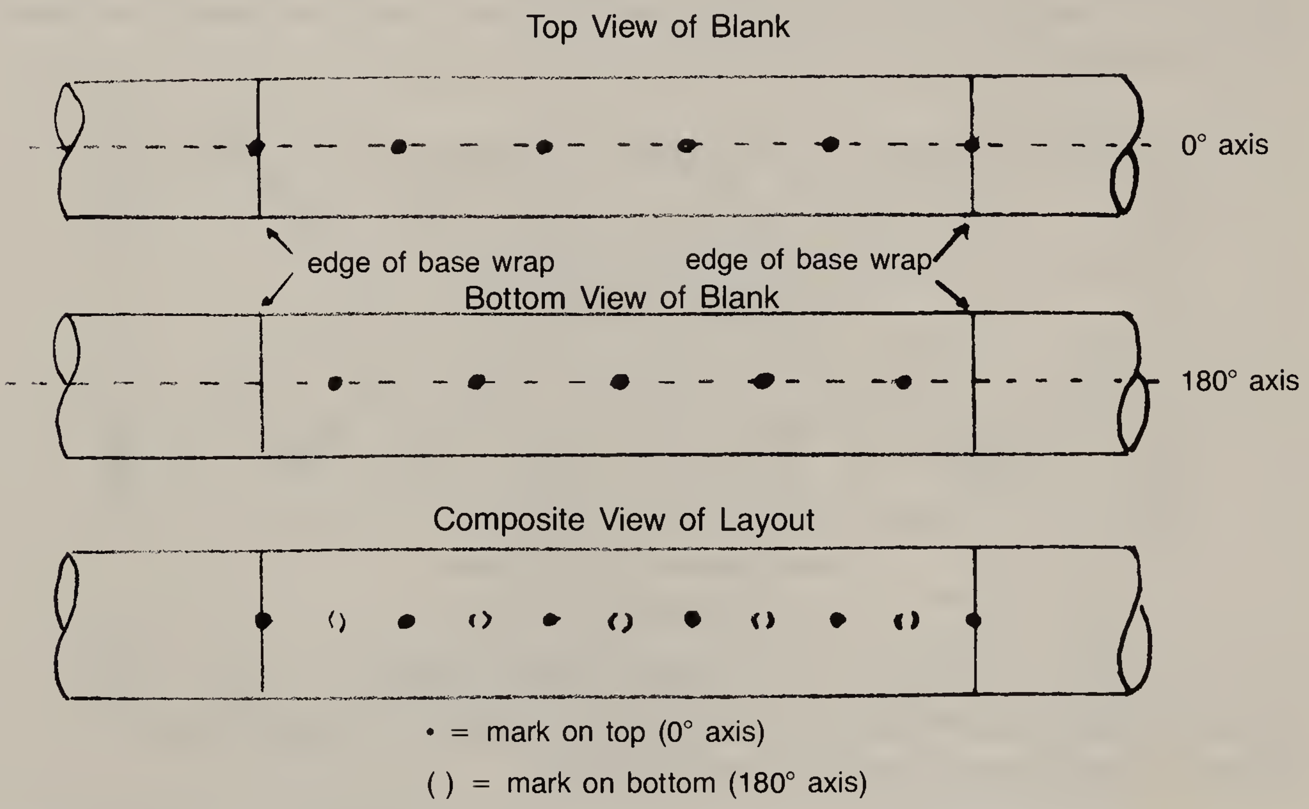
Unpeel the inboard piece of tape at the butt end. Lay it flat on your workbench and mark its exact center. You can either measure this with a ruler or divide it with a pair of dividers (or a compass). Unpeel the tape from your bench and put it back on the blank exactly as it was before. Use the 0° axis mark on the tape next to it for alignment.

Repeat this procedure at the tip end. You now will have the 180° axis—exactly halfway around the blank—marked at each end of the wrap. But, as you can see, it is faster and easier to use the circle template to mark these axes before wrapping the guides.

Returning to our sample single-diamond layout, we are now ready to mark each of the centers where the threads will cross. We need to locate these on the 0° and 180° axes which were marked earlier on the blank with the circle template. Lay the blank in the groove of the Butt Wrap Alignment Tool with the foregrip against one end. Place the clear plastic top plate on top of the blank with one edge tight against the backboard along its entire length. The front edge will be resting on top of the blank. *Whenever you use the tool, make sure the top plate is against the backboard.*

Rotate the blank until the 0° axis mark is directly beneath the front edge of the top plate. The 0° axis is now an invisible line along the blank under that front edge. You know your space between centers, the circumference, is 44mm, so you could simply measure and mark each center along that line. Your measurements would start at the circle you scribed near the foregrip.

There is an easier way, provided you have a pair of dividers or a drawing compass. Set the dividers to the circumference as indicated by the mark on the tape you peeled off earlier. Place one point on the beginning of the wrap and the other along the straight edge. Scribe a tiny arc 1/8 to 1/16 inch down to the straight edge. Lift the dividers and use one of the points to scribe another tiny line along the straight edge, thereby forming an upside-



Single cross-wrap layout. Note that the centers on the bottom view (180° axis) are halfway between those on the top view (0° axis). Composite view shows both sets of centers.

down "T." The intersection marks the diamond centers. Set one point on the center you just made and repeat the process until you have marked all the centers.

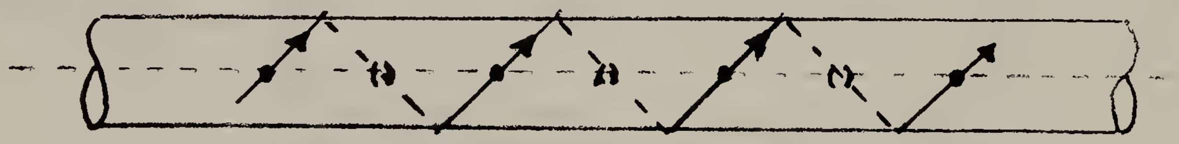
The centers along the 180° axis are done the same way except that they are "staggered." That is, the first (and last) is only half the circumference from the starting (and ending) point. Either measure this distance or divide it with dividers, and mark it on the blank. The remaining centers are made with the dividers set at the full circumference.

Your layout is complete and should look like the drawings. You're ready to wrap, but first let's discuss how to deal with some layout variations.

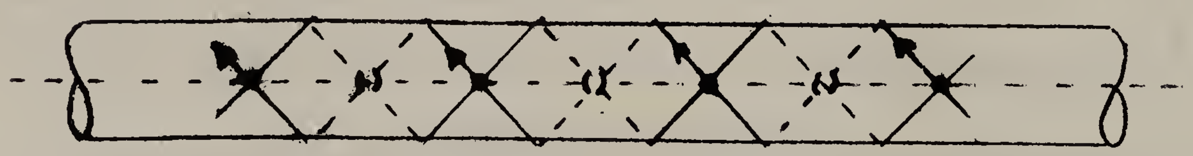
If you are using an underwrap, it works out most easily and accurately if you determine its length and make it before the guides are wrapped on. Then the circle template is slipped over the blank, and each axis is marked with a pencil dot near the foregrip. These dots are your reference marks for later aligning the top plate with each axis. Some rod builders even color-seal and apply a coat of finish to the underwrap initially so that they can later mark the centers, using the method described.

If you did not make the underwrap before wrapping the guides onto the rod, use Ray Walker's technique described earlier. By whatever method, we'll assume you have the 0° and 180° axis marked, as well as the point from which you will measure the start of the wrap. Place the blank in the tool and align the edge of the top plate with the axis. You can then use the same system but use a drawing compass and place a pencil dot at each center. An alternative is to apply a couple of pieces of double-stick tape to the top surface of the top plate. On top of this, lay a ruler so that its edge is next to the front edge of the top plate. Line up the ruler with the mark indicating where the measurements will start (at the inner edge of the base wrap.) The double-stick tape will hold the ruler and you can make a pencil dot at each measured spacing along the axis. These dots mark where the first threads will cross, and will subsequently be covered by the pattern.

That should cover any variations on a single cross-wrap layout. You can now spiral the first thread up and down the blank by simply following the marks you made on the blank. Your wrapping thread should cross each mark as accurately as possible, as shown on the drawings.



thread spiraled up the blank



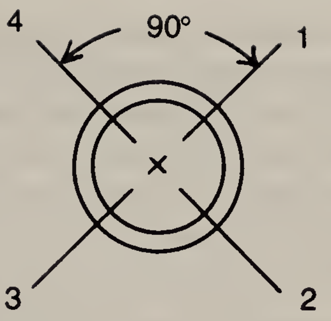
thread spiraled down the blank

— = thread on top of blank

— — = thread on bottom of blank

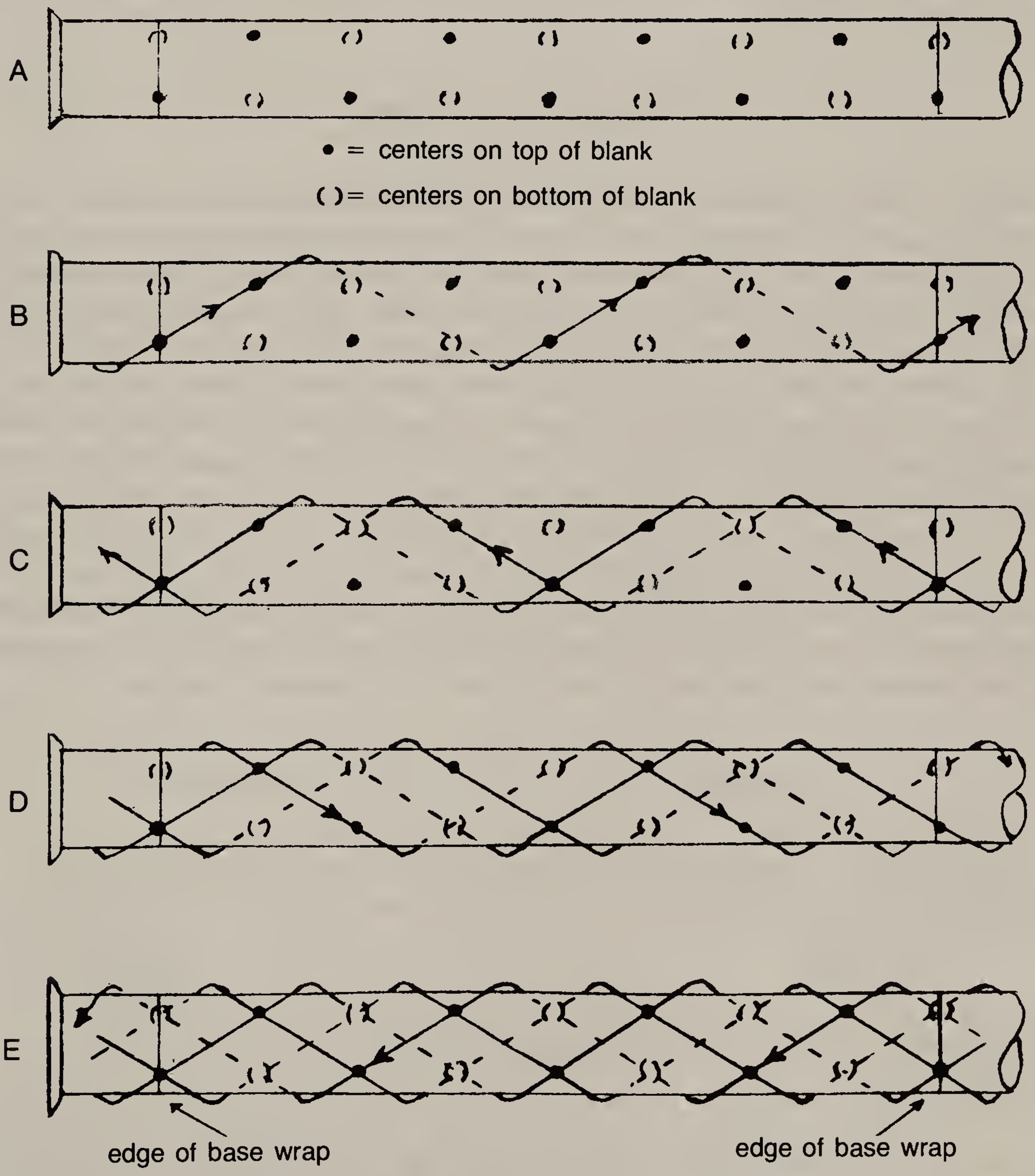
Composite view of single wrap. Top: First wrapping thread spiraled up the blank. Bottom: Wrapping thread spiraled back down the blank.

The above procedure is for a single cross wrap. Let's see where it would differ if you were laying out a double wrap such as double diamonds. First of all, you will have twice as many diamond patterns: top, right side, bottom, and left side. If you wanted the



Double cross wrap, composite view. Blank rotated 45° in order to show all four alignment axes.

patterns to be square, your space between centers would be *one half the circumference*. For example, if your circumference is 44mm, then the spacing for centers is 22mm. The diamond patterns on the 0° axis (top) and the 180° axis (bottom) will be exactly opposite



Double cross-wrap composite view: (A.) Centers are marked on all four axes. (B.) First wrapping thread spiraled up the blank. (C.) Second thread spiraled down the blank. (D.) Third thread spiraled up the blank. (E.) Last thread spiraled down the blank.

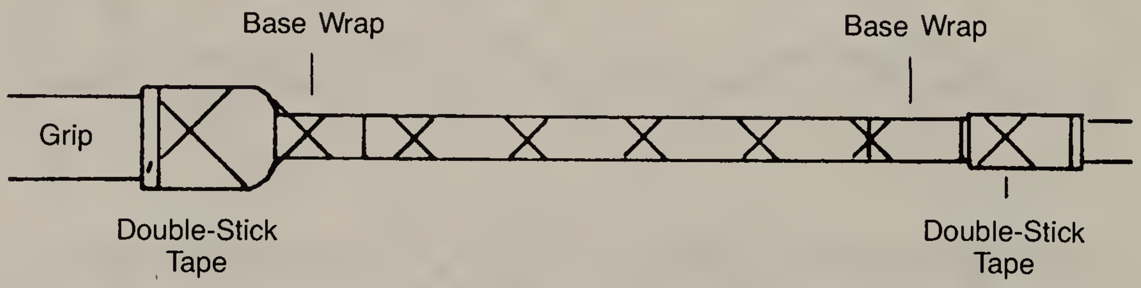
each other. They are laid out with the first center being 22mm from the starting point. The diamond patterns on the 90° axis (side) and the 270° axis (side) will also be exactly opposite each other but they will be staggered in relation to those on the top and bottom. Therefore, the space between the starting point and the first center will be 11mm on the 90° and 270° axes. The balance of the centers will be 22mm apart, and the space from the last center to the end will again be 11mm.

To give you an idea of what this looks like, let's again use a composite-view drawing. However, in order to see all four axes, the drawing is made as if the blank had been rotated 45°. The bottom row of centers will be the 0° and 180° axes, and the top row of centers will be the 90° and 270° axes.

The first drawing shows all centers marked on all four axes of the rod. The second drawing is of the first wrapping thread after it has been spiraled up the blank. The third drawing shows the second wrapping thread spiraled down the blank. The fourth drawing shows the addition of the third wrapping thread spiraled up the blank, and the fifth is of the fourth wrapping thread spiraled down the blank. We now have an accurate layout for making a *double* cross wrap.

Techniques for cross wraps

With the layout completed we can turn our attention to some of the other common techniques and options for making cross wraps. Most rod builders learn these wraps by taping each course of thread in position with pieces of masking tape. A faster method is to use a fairly wide piece of double-stick tape (coated both sides) or carpet tape. It is first necessary to wrap the blank, hosel, or cork grip beneath with a layer of regular masking tape. This makes removal of the double-stick tape easier without damaging the rod. As each course of thread is wrapped, the ends are just pressed tightly in place on the double-stick tape with your thumbnail. The loose ends are then cut nearly flush with the edge of the tape. This keeps them from falling back on the tape and forming a tangle of imbedded thread. If for any reason, such as crowding or handling, the threads are not sticking properly to the tape, apply another layer over the top. Do the same if stopping for a prolonged period in the middle of the wrap. When the wrap is completed, cover the thread and double-stick tape with a layer of regular masking tape. This is just good insurance to prevent a thread or two from coming loose during the subsequent handling.



Using double-stick tape to hold wrapping thread is faster than taping each thread in place with masking tape.

To remove the layers of double-stick tape after the wrap is bound down by the base wraps, use a pair of thin pointed scissors or snips. Slide the open point between the bottom layer of masking tape and the first layer of double-stick tape. Make small, snipping cuts across the tape. You will probably find that the cut proceeds in a small spiral rather than straight across. After the cut you can peel off the entire layer of tape. This is much easier than trying to peel off individual layers of uncut double-stick tape.

If you frequently wind bands of up to four threads wide, and experience problems with it twisting as it is laid in position, here are some helpful hints. Always cut the threads longer than needed. Place the ends firmly on the doublestick tape two at a time and spread them fanlike on your workbench surface. Grasp them close to the tape where they are in proper position, and slide your thumb and forefinger up the threads a good distance from the blank. They should feed into your hands without tangles. Keep your hand at this distance as you wrap the band of threads, and move it to the right so that the thread is fed to the blank at the same angle as the spiral. Pressure of your thumbnail against your index finger should eliminate any tangles. However, even if a twist does slip through, the distance of your hand from the blank should enable the thread to lie in a flat, untwisted band.

A trick used by RodCrafter Harold L. Titus is to use a fine-tooth comb to separate the threads. He holds the comb in his right hand, teeth up, and runs the threads through the individual teeth. He places his thumb against the threads at the base of the comb. A jig designed by RodCrafter Don Dewey is also listed in the chapter on tools.

The base wrap which binds down the threads is common to all cross wraps. It should be smooth, tapered, and not bulky-looking. Use Size A thread with greater than normal wrapping tension. After about one-quarter to one-third of the length is covered, stop wrapping, but keep tension on the wrapping thread. Use fine-pointed scissors to first cut the threads just in front of the double-stick tape. Use the pointed end of a thread tool to comb the threads of the pattern straight. Again use the scissors to cut the thread, but this time close to the edge of the base wrap. Cut them on about a 45° angle. Take a razor blade or an X-Acto knife and trim the threads at an angle while fraying their ends. This will create fuzz, which can be removed with a piece of masking tape pressed over and then removed. Continue winding the base wrap over the angled and frayed ends of the threads and complete it with a tie-off loop, When burnishing the base wrap to close any gaps, always burnish *away* from the center of the cross wraps.

In just about every case you can improve the appearance of a completed cross wrap before the color preserver and wrapping finish is applied. A pair of Thread Tools can be used to push loosely packed threads into position. For example, on a diamond wrap *push on opposing points of a diamond.* Do this on both sides of an individual diamond to pack the threads together and to define the shape properly. In fact, you should not wait until the wrap is completed before packing the threads. It's best to wrap a few courses of thread onto the blank, using as little tension as possible—just enough to keep the thread in place—then stop and pack the threads together using your Thread Tools and fingernails. If you cannot get the outer threads to stay in place, you need to push on the corners or points of the diamond. This is where the threads interlock and take up more space. The interlocks can be packed more tightly by pushing on opposite points; then the threads along the side of the diamond will lie against the prior threads.

A different technique and sequence for completing a cross wrap is used by RodCrafter Ken Wiebe. At the point where the wrap is ready to be bound down with the base wraps, Ken first gets all the threads in place as just described. Then, while the threads are still held in place by the tape, he gives the wrap three coats of color preserver. When dry, the wrap is glued in place. He then uses a sharp blade to cut the threads at an angle, forming a neat, smooth taper. Lastly, the base wrap is wound in position over the tapered ends.

SOME SPECIFIC WRAPS

Some specific wraps and the techniques used in making them are presented to add to your knowledge of patterns, as well as to provide ideas from which you can create your own new wraps. The patterns progress from the more simple to the more complex. Also, a technique explained in one wrap is frequently used in a succeeding wrap. As mentioned at the beginning of this chapter, it is assumed that the reader is already familiar with how to make a basic diamond wrap and chevron wrap. If not, he should refer to *Fiberglass Rod Making,* where detailed directions are given.

Mylar-accented diamonds

This is a wrap that requires no special threadwork beyond that employed in making a regular diamond wrap, yet it is quite striking in appearance. The center of each diamond is a tiny metallic highlight made of mylar. Mylar is a space-age foil, quite thin and pliable, yet tough and tarnish-proof. It is readily available from most fly-tying-supply houses, as well as art and graphic-arts stores. It comes in silver, gold, and many metallic colors. Silver is a good choice if you are using chrome-plated guides. Gold ties in well with the many anodized-aluminum gold reel seats.

Usually only a tiny diamond in the center of each regular diamond is desired. The mylar will stand out best if it is surrounded by darker-color threads. Therefore, you will want to plan your pattern so that the center colors are light (these are the ones covered by the mylar) and the next band is dark in order to border the mylar. For example, I recently wrapped a pattern in Size A thread on a gold blank that started with one center white NCP thread, bordered on each side by two metallic-gold threads. At this point the wrap was stopped and the mylar applied over the five threads forming the tiny diamond.

To apply the mylar, first cut it into a strip about three times as wide as the width of the threads to be covered. In our above example this was five threads. Give the back of the mylar strip a thin coat of Duco cement or a similar adhesive. Immediately cut the strip into squares. Place a square, adhesive side down, over each of the tiny diamonds thus far formed in the wrap. Press the mylar in place so the adhesive holds it there. You do not need a firm glue joint, just enough to temporarily hold the mylar in place while you wrap over the edges. The thread will hold it securely once the balance of the wrap is made. Incidentally, you can sometimes find mylar with an adhesive already on one side, which simplifies the job.

With the mylar squares in place on each diamond, proceed with making the wrap. In our example I next used a band of four dark-brown threads on each side and over the top of the mylar edges. As this band was applied it bound down the mylar. To give you an idea of what the rest of the wrap looked like, I then applied bands on each side consisting of the following: two brown, two metallic gold, one white NCP, two metallic gold, two brown, and two dark brown.

When you tighten up the wrap with a thread tool or your fingernails, first push the outside threads of each diamond toward the center, as usual. Then, to accurately shape and define the mylar centers, use a thread tool to push the inner dark threads around the mylar toward the *outside.* Apply a few coats of color preserver at the prescribed time intervals and finish wrapping finish.

Transparent mylar diamonds

This is the same kind of wrap just described, except that the creative technique of omitting color preserver is used. With no color preserver, the wrapping finish turns the medium-colored and dark-colored threads transparent. A square of mylar is placed over the first four or five threads. This mylar square should be almost as big as the diamond will be when it is finished. Any light-colored threads used in the wrap (white, yellow, goldenrod, light blue, etc.) must be NCP, or they will lose their color and become muddy. The medium and dark colors are all regular thread.

An example may help. The first course of Size A thread consisted of one white NCP bordered on each side by four white NCP. Over these white "crosses" were placed silver mylar squares. The wrap then proceeded with bands of each side of: four brown, two orange, one white NCP, two orange, and finally four brown. No color preserver was used and Crystal Coat two-part epoxy finish was applied directly to the wrap. You must use a thin finish about the consistency of varnish. A thick epoxy or polymer finish will not penetrate rapidly enough to displace the air trapped among the threads. The air will escape while the thicker finish is curing, and tiny bubbles will be trapped within it.

The finished diamonds have a unique three-dimensional effect. There is, of course, a tiny highlight of mylar in the center. The balance of the threads wrapped over the mylar square are all transparent except for the thin square of one white NCP Size A thread. This appears to float on top. The mylar square beneath the threads reflects light and increases the transparency effect.

A variation of this transparent wrap could be made without the tiny mylar diamonds showing in the center. In this case the mylar would be used only to reflect light through the diamonds, heightening their transparency. To do this you would have to glue the mylar squares on the blank (in exactly the proper positions) before any threads were wrapped. This can be done by carefully sliding the squares underneath the single thread forming the initial cross pattern.

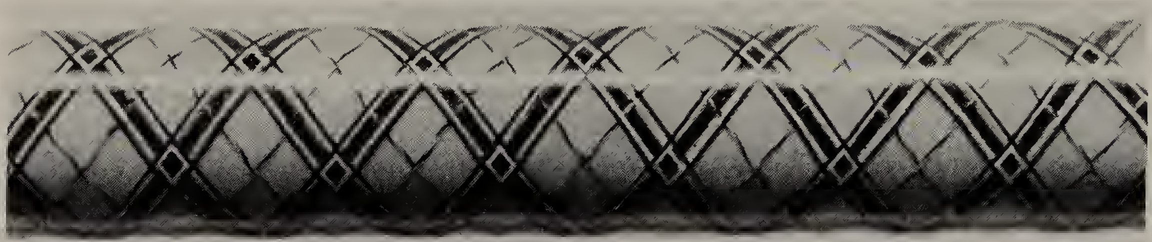
Diamonds with trim threads

This style of diamond wrap is quite easy to make. In its simplest form it starts with an already completed diamond wrap. Additional threads are added a short space away from the outside edge of the diamond pattern. They are always parallel with the basic diamond wrap as they spiral up and down the blank. The number of these threads and how close or wide they are spaced, both to the diamond and to each other, is up to the person making the wrap and the effect he wants to achieve.

One version might consist of just a narrow band of two or three threads a very short space away from the outer edge of the diamond. This acts like an accent border surrounding, but not touching, the diamonds. Just one such band might be used, or two bands with a space between them might look better to the creator.

A different approach would be to place a band of threads exactly halfway between the existing diamonds. To do this, start a thread so that it crosses the base-wrap mark at a point exactly in line (on the same axis) as the centers of the existing diamonds. It should spiral up and down the blank at the same angle as the threads forming the diamonds. This will keep it centered in the open space. The crosses formed by this thread will be on the same line (axis) as the existing diamonds, and precisely midway between them. This can be simply a narrow band of thread, or it presents the option of using the first thread spiraled up and back as the center for a second, small diamond pattern.

Let's consider the first alternative, simply a narrow band of thread. RodCrafter Al Clark makes a very handsome wrap using this technique. Since he builds a great many custom saltwater rods, his wrap is often on blanks with a moderate to large butt diameter. Yet, his variation retains a delicate and intricate appearance. He starts by making small diamonds, usually on a multiple pattern, such as double diamonds. He then places one single two-tone thread ("jasper" or "tweed," as it is sometimes called) between each of the diamonds. The tiny, repetitive color changes along the single thread make it almost look like fine wire. Combined with the many small diamonds it makes a most unusual wrap.



Small diamonds with single two-tone thread wound between diamonds.

Staying with the single, narrow band of thread between the diamonds, another effect is possible. In addition to that band, we could wrap another narrow band of thread (perhaps two threads wide) *over the top* of the previously made diamonds. This band would cross in exactly the center of each diamond. When the finished wrap was examined we would have a plaidlike pattern. Perhaps you are beginning to see the whole family of wraps that can be built around the basic diamond format.

Alternating diamonds

When we first discussed the technique of adding a thread midway between the existing diamonds, we said it presented the option of using that thread as the center for a second, small diamond pattern. Let's explore this further. To make a small, second set of diamonds, lay a thread or a band of threads to the right of this first thread, then an exact duplicate to the left—the same as for building any diamond wrap. A pattern can thus be developed of tiny diamonds alternated between the regular larger diamonds. The bands of thread forming the small diamonds will cross *over* the midpoint of the bands forming the larger diamonds. If it is preferred to have them underneath, then the small diamond pattern must be wrapped on the blank first. You would provide for this in your original layout.

Let's expand this idea even further. We could make the second set of diamonds identical to the first set, in both size and color pattern. However, if we used normal spacing between diamond centers to produce square diamonds, the wrap would get rather crowded and a lot of the effect would be lost. It would be better to increase the space between diamond centers when we laid out the first diamond wrap. This space could be as much as twice the normal measurement. The shape of the diamonds will naturally elongate along the axis of the blank, but this will add to the overall effect. Assuming this was a single diamond to start with (rather than a double diamond, which would probably get too crowded-looking), we would end up with a pattern of diamonds on the top and bottom (0° and 180° axes) and crossover bands of thread on each side (90° and 270° axes).

Solid line of diamonds

This particular pattern is made using exactly the same techniques as just described above for alternating diamonds. The difference is that the space between diamond centers on the layout is kept small enough so that the alternating diamonds will touch against each other, and the entire blank will be covered with thread. In this case, since the distance between diamond centers is smaller than normal, the diamonds will elongate across the axis of the blank.

Again, proper layout is the key. The trick is to determine beforehand the measurement across the diamonds in the first diamond wrap that will be made. We are referring here to the length of each diamond from one outside point to the other outside point, as measured along the axis of the blank. This does not have to be exact, since the sizes of the two sets of diamonds do not have to be exactly the same. In fact, the pattern looks more interesting if one set of diamonds is just slightly larger than the other. I have no formula for determining this. You can probably estimate closely enough by measuring some other diamond wrap previously made on which diamonds are approximately the same size and shape. If the diamonds on the other rod are closer to square, reduce the measurement proportionately for the elongation (and compression) of the new diamonds across the axis. Another approach is to make a single, sample diamond on a piece of card stock covered with double-stick tape. This technique for planning is explained, further along in this chapter.

Once you have your estimated measurement, use it for marking the centers on your layout threads. Then proceed to make the first diamond wrap. When it is completed, carefully measure the space between the outside points between two diamonds. You want to place the initial thread on which your second diamond wrap will be built precisely in the center of the space between the first two diamonds. This is critical. You can use a long ruler which can be kept in perfect alignment along the axis of the centers of the first set of diamonds. Locate the exact center between each diamond and mark it precisely on the blank.

The second diamond wrap is made by first spiraling a thread up and down the blank so that it crosses exactly on the marks just made. Now proceed to build the second set of diamonds around that thread. As the width of the diamond expands you will reach a point where the diamonds touch. Unless you are extremely fortunate, there will still be gaps at many points where at least one more thread can be fitted into the pattern to completely cover the blank. Now comes some careful manipulation of the threads—the second trick involved in this wrap.

While good strong fingernails can be used, I strongly recommend the pointed end of a Thread Tool. Using it, you can force some threads farther apart so as to make way for the last thread or two needed to cover the blank. In some spots you may have to burnish, or push, threads from the *inside* of adjacent diamonds to fill a gap. Between opening or creating space in some spots of the wrap (for the last thread), and closing the gaps in other spots, you will get the wrap to fit together. A final burnishing of the entire wrap will close any small gaps, and your masterpiece is completed. It will be an impressive-looking wrap, sure to draw compliments and closer examination.

I would like to interject that this is what is known as a "closed" wrap. The entire section of the blank was covered with thread. The name derives from the fact that you keep wrapping until the thread closes upon itself. In this book we will cover at least one other pattern that is a closed wrap, the tartan. If your interest in thread artistry continues beyond this book you will find that many of the more advanced designs are done as closed wraps to completely isolate the pattern in a background color.

If you make a few closed wraps you will find that you generally have problems fitting in the last few threads to completely cover the blank. At the tip end of the wrap, there will be no more room, while at the larger butt end there will still be an open space to be filled with thread. This occurs because the blank is tapered. It takes less turns of thread to fill the smaller tip end than to fill the larger butt end. Therefore it is best not to use a closed wrap if it will fall on a sharply tapered section of the blank. You can check the taper by measuring the circumference at each end. Another suggestion to minimize the problem is to keep closed wraps fairly short. They can be made to appear longer by using long base wraps (only a portion of which actually bind down the ends of spiralled threads.) These long base wraps can have some trim bands within their borders to break the long lines.

Lattice diamonds

We just discussed the technique of spacing the patterns and the threads so close together that the entire blank section was covered with thread. Not a bit of the blank showed through. Now, let's examine just the opposite technique—purposely allowing a lot of open space within the diamond pattern itself. The effect reminds me of old-fashioned garden trellises made of latticework, hence the name. It might look like lace to someone else. In any event, it is a light, airy pattern, both delicate and intricate-looking.

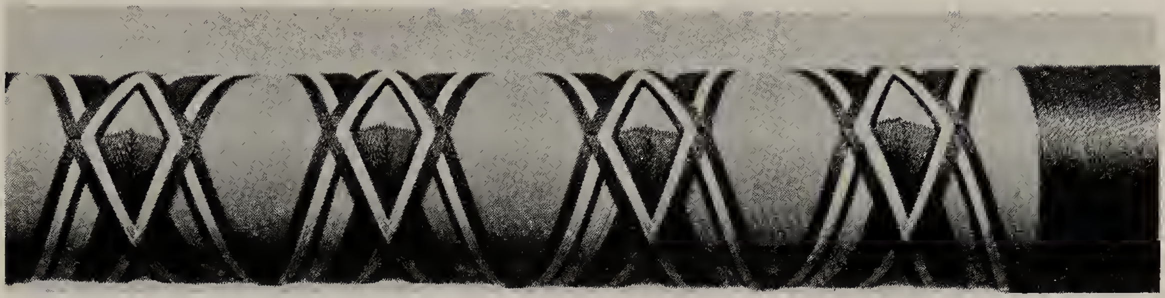
The basic idea is to form the regular diamond pattern, but not to lay each thread or band of threads against the previous thread. Instead, varying amounts of space are left between threads, or narrow bands of threads. Each must be exactly parallel to the previous thread and remain at the same distance as it is spiraled up and down the blank.

Variety is the key in designing and making these wraps. The center can be solid, forming a tiny diamond, or it can be completely open with the diamond being formed outside the center. The color of the blank can be allowed to show in the open spaces, or the blank can be first underwrapped. The large open pattern can be formed entirely of bands of thread in twos or threes, or these bands can be alternated and interspersed with single threads. A little experimenting will reveal some very interesting patterns quite applicable to certain rods.

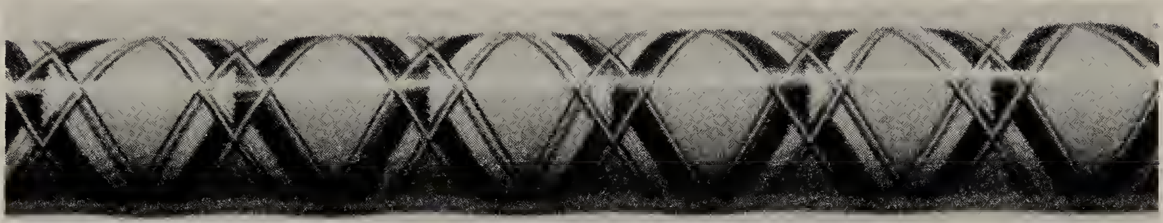
Split-center diamonds

So far all our discussions of diamond wraps have been of conventional shaped diamonds. Regardless of the manner in which it has been utilized, the pattern itself has been the same. The center has been of one color, formed in the shape of a diamond. Around it are concentric diamonds formed of alternating or different colors. It is possible to make the center of the diamond of two colors, splitting the pattern in half. The split can be either along the axis, or across the axis.

I first saw this pattern in wraps done by RodCrafters Al Clark and Joy Dunlap. To anyone used to seeing conventional diamond patterns, it is immediately intriguing. Joy and Al's offshore trolling rods are built for affluent customers all over the world. These



Split-center diamonds—along axis.



Split-center diamonds—across axis.

anglers have seen a lot of diamond wraps, and the split center captures their attention and increases their pride of ownership.

The technique of making a split center is all in the sequence in which the threads are added. A base wrap is required at both ends, and in order to get an even effect, *one thread at a time* is wrapped rather than bands of thread. The best way to explain this is by way of examples.

Let's suppose we wanted to make a split center of black and white, and we wanted the split to be *across the axis* of the rod. First spiral your initial cross threads of either white or black. This is your center thread, as in any diamond pattern. We will first add a thread to the right spiraling up the blank, then a thread to the right spiraling down the blank. Next, we will shift to the left side of the center thread and spiral a thread up the blank, then spiral a thread to the left back down the blank. The color sequence would be as follows:

SPLIT ACROSS THE AXIS

Side	*Direction*	*Color*
right	up	black
right	down	black
left	up	white
left	down	white

This would be repeated as many times as necessary to build the center of the diamond to the size desired. Obviously, the split will not show up very well unless the center is reasonably large. Next, in order to define the outside of the diamond pattern, another color is added as a border and wrapped in the conventional manner. If it is red, then red threads (or bands of threads) are wrapped to the right *up* and *down* to the left. This could be followed by another border, possibly white or black, the same as making any diamond. In other words, once the split center is made, the technique for the balance of the wrap is the same as any diamond.

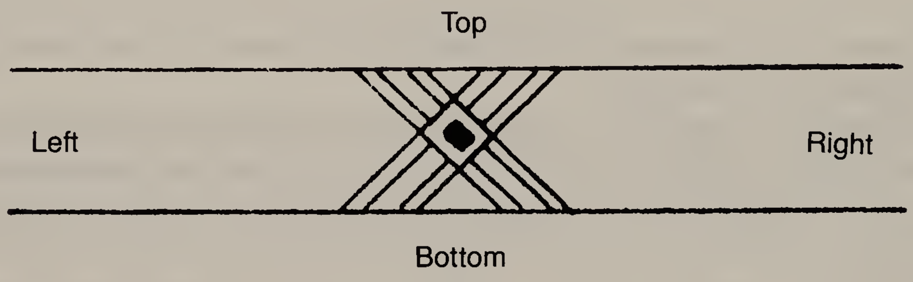
If we wanted to make a split center of black and white, but wanted the split to run *along the axis* of the rod, the following sequence would be used:

SPLIT ALONG THE AXIS

Side	Direction	Color
right	up	black
right	down	white
left	up	white
left	down	black

I've found that some people get confused by the terms "right" and "left" as expressed in the directions above. We are referring to the right or left side of the initial layout thread, as if we were facing forward in the direction it was wrapped. Another way of expressing it would be to the right or left of the center of the diamond as we looked down on the blank as shown in the drawing.

Split diamonds are one of the most used techniques for forming parts of more intricate advanced patterns. To get the diamond to split in a straight line, it is necessary to always wrap this portion of the pattern *one thread at a time*. Filling in or bordering of the split diamond can be done with bands of thread.



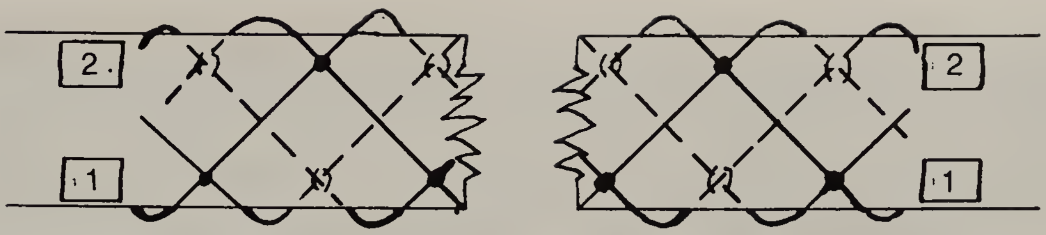
Wrapping terms defined.

Double diamonds

The real trick to perfect-looking double diamonds is in the layout. We have already covered this and diagrammed what the layout of the four marked alignment threads would look like. Also using a diagram, we traced the path of each of the four center wrapping threads. From here, it is simply a matter of wrapping the threads around the four center threads *in the proper sequence*. The sequence is emphasized because that is what makes exactly the same diamond pattern at each point where the initial wrapping threads cross.

Perhaps it might help to view the technique as making two separate diamond wraps, but constructing each stage simultaneously. To keep track of this process when making a double wrap, select one of the four threads forming the crosses and label it # 1. Do this by placing a small square of masking tape on which you have penned "#1" on the outside of your piece of double-stick tape. A duplicate piece of tape labeled the same way is also placed on the other end of the wrap. Then make a #2 label and place it opposite the next thread forming the crosses. This too is labeled at both ends of the wrap. Now consider the #1 thread as your first diamond wrap, and the #2 thread as your second diamond wrap.

Select the color and width of the first band of thread that will be placed around the center thread to form your diamond pattern. Let's suppose it is four threads wide and gold. Start your wrap with the #1 wrap. Spiral a band of gold to the *right of the #1*



Double cross wrap, labeling each set of crosses with masking tape to keep track of sequence.

thread, up the blank and back down. Now move over to your #2 wrap and spiral a band of gold to the *right of the #2 thread,* up the blank and back down. Go back to your #1 wrap and spiral a band of gold to the *left of the #1 thread* up and down the blank. Once again return to your #2 wrap and spiral a gold band to the *left of your #2 center thread* up and down the blank.

Get the idea? First to the right of #1, then to the right of #2. Next to the left of #1, then to the left of #2. This is the important sequence mentioned earlier. With it you are making two diamond wraps simultaneously. Always use this sequence and the individual diamonds of your double diamond wrap will be identical.

To simplify things we have said to spiral a band of thread up the blank and then back down. You will be using a base wrap at each end to bind down the wrapping threads, and will start the band by laying it across the double-stick tape at the bottom of the wrap. When you get to the double-stick tape at the opposite end of the wrap you will lay the threads over it. At that point you can trim the thread ends forming the band and start another band of threads to go back down the blank. Just be sure you place it to the right side of the #1 center thread. On some patterns, such as split diamonds, this method is necessary.

Another approach is to use a band of thread long enough to be spiraled up and down the blank. In this case when you reach the upper piece of double-stick tape, lay the band across it to anchor the band of thread. Then take a turn around the blank just past the double-stick tape, reverse direction and spiral the band back down the blank to the right of the #1 center thread. This method is fine for regular diamond patterns.

Labeling the center threads at each end of the wrap is important. It will allow you to always bring your band of thread back down the blank by bordering the proper thread. As you do, always place the band on the *same side* of the center thread as you did when you spiraled the thread up the blank. If you went to the right when going up, you must go to the right when coming back. If you went to the left going up, you must go to the left when coming back.

To complete the double diamond wrap just add the required bands or single threads of the desired color. Follow the sequence described for each additional color. When you have added all the colors and bands desired, place a piece of masking tape over the thread-covered pieces of double-stick tape. This will lock them securely in place. The pattern will extend past the scribed circle marking the inner edge (toward the center) of each base wrap. All that remains is to bind down the pattern at each end with a base wrap.

Double chevrons

The layout and general method of forming a double chevron pattern is essentially the same. The sequence of going first from the #1 thread (or #1 wrap) to the #2 thread (or #2 wrap) is the same. The difference is that you do not make a chevron wrap by bordering a center thread with bands to the right and then to the left. Instead, each succeeding band of thread is always placed *to the right* of the preceding thread or bands of thread.

Thus, when making a double chevron wrap the overall sequence would be as follows. The first band would be spiraled up and back *to the right* of the #1 thread. Then you would move to the #2 thread and spiral a band up and back *to the right.* At this point you would change color and spiral a band *to the right* of the #1 wrap. The same color just used would then be spiraled *to the right* of the #2 wrap.

Colors and width of bands would be changed as needed to develop your pattern. Each succeeding band would always be placed to the right of the preceding band until the pattern is complete. By using this sequence each individual chevron would be identical. The wrap would be bound down with a base wrap at each end, the same as for a double diamond pattern.

A very interesting "full" wrap can be made of a double chevron by spacing the patterns close together. You provide for this when you mark your alignment threads. Use a measurement of no more than one-half of that required for a 90°, or square, crossing of threads. Depending on how wide a band of wrapping thread you use, and the space between patterns, you can make a wrap that allows only a small amount of the blank (or underwrap) to show through. The appearance is one of a relatively tight and full weave.

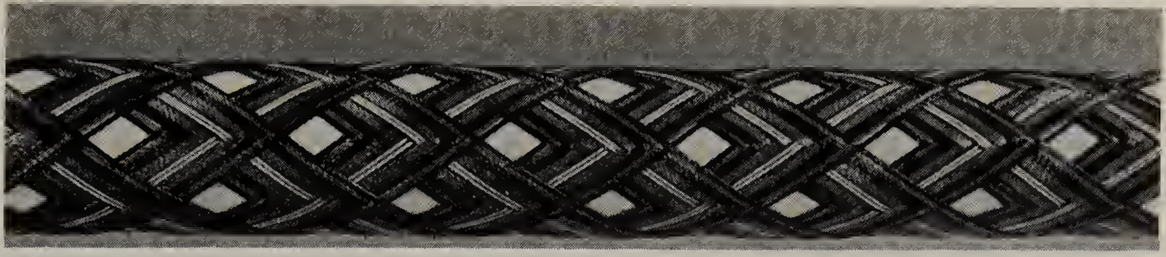
On chevron wraps in general I see quite a few that are made with bands of exactly the same width. While this undoubtedly has its place, I think you will find more interesting designs can be made by varying the width of the colored bands. For example, here is a pattern I made recently of Size A thread on a gold blank: two brown, two dark brown, one white, two dark brown, four metallic gold, one dark brown, four metallic gold, two dark brown, one white, two dark brown, two brown. Another effective use of color on chevron wraps is to separate different bands of medium and dark colors with a single white N.C.P. thread. Or, if the wrap is mostly of lighter threads, to use black or a very dark color as a single thread divider. This brings out the arrowpoint shape of the chevrons.

When making a double chevron you will be using base wraps at each end, and pieces of double-stick tape to hold the threads. Instead of running each of the two chevron wraps in the same direction from the butt end, consider running one from the tip end. The resulting design will have points facing each direction. Use the same sequence of alternating from the # 1 wrap to the #2 wrap. The only difference is that the #2 wrap starts at the tip end and spirals down toward the butt, then up toward the tip end.

Multiple chevrons to produce "diamonds"

Our discussion of layout and wrapping sequence have been for the double cross wraps. As we have seen these are built on four axes around the blank: 0°, 90°, 180°, and 270°. To put it another way, we have made a pattern for each one-quarter of the blank's circumference. Naturally, a rod builder is not limited to just a single cross wrap (two axes) or a double cross wrap (four axes). If the diameter of the blank is large enough and/or the size of individual patterns is small enough, you can make a wrap built on any even number of axes. As long as you lay out the alignment threads properly and follow the sequence of moving from the first wrap (#1) to the second wrap (#2) to the third wrap (#3), etc., you will experience no difficulties.

A favorite wrap of mine consists of a pattern of chevrons on eight axes, or eight times around the circumference. I find the wrap generally fools people into thinking it is some kind of a diamond wrap. This results because I place a light underwrap on the blank



Multiple chevrons to produce "diamonds."

first, then make the chevrons of medium and dark colors. The small spaces between the chevrons are diamond-shaped. They stand out because of the light-colored underwrap. It is a comparatively simple wrap to make, yet it looks quite complex.

Multiple chevrons are easier to make in one regard than multiple diamonds. If you were to make a wrap of eight diamonds around the blank you would really be making four diamond wraps. As we have seen, you would have to follow the sequence described and make all four simultaneously. However, because of the nature of the chevron pattern itself, you can first lay out the wrap for a double chevron (four axes). After completion of the first double chevron wrap you can add another double chevron wrap consisting of four more axes. This second pattern is shifted 45° around the blank. If the thread pattern is identical to that used on the first double chevron, they both will blend together perfectly.

To make this wrap, first determine the total length, including base wraps, and make a light-colored underwrap of that length. Following the procedure explained earlier, measure and mark four alignment threads and tape them in place along the four axes of the blank. After four threads are spiraled to form the crosses, snip the alignment threads and carefully remove them. Build a double chevron wrap by adding bands of thread alternately to the right of the first (#1) and second (#2) wraps. Record the number of threads of each color in each band.

To add the second double chevron you can shift the pattern 45° by sighting on the existing wrap. Now, refer to your notes. Wrap the exact same bands as to number of threads and color as you used on the first wrap. Remember to shift back and forth between your new #1 and new #2 wraps, but always wrap to the right.

When the entire wrap is finished, bind down each end with a base wrap. Use a pair of Thread Tools or your fingernails to push the threads together. You want to make sure that the light-colored diamond spaces from the underwrap are all the same size and shape.

Diamonds surrounding diamonds

This is a wrap I have used mostly on medium- to large-diameter saltwater blanks, but the technique is applicable to most rods except those of very small diameter. As is true of so many wraps, there are quite a few variations possible. If you understand one specific version you will know the fundamentals and can then make your own designs.

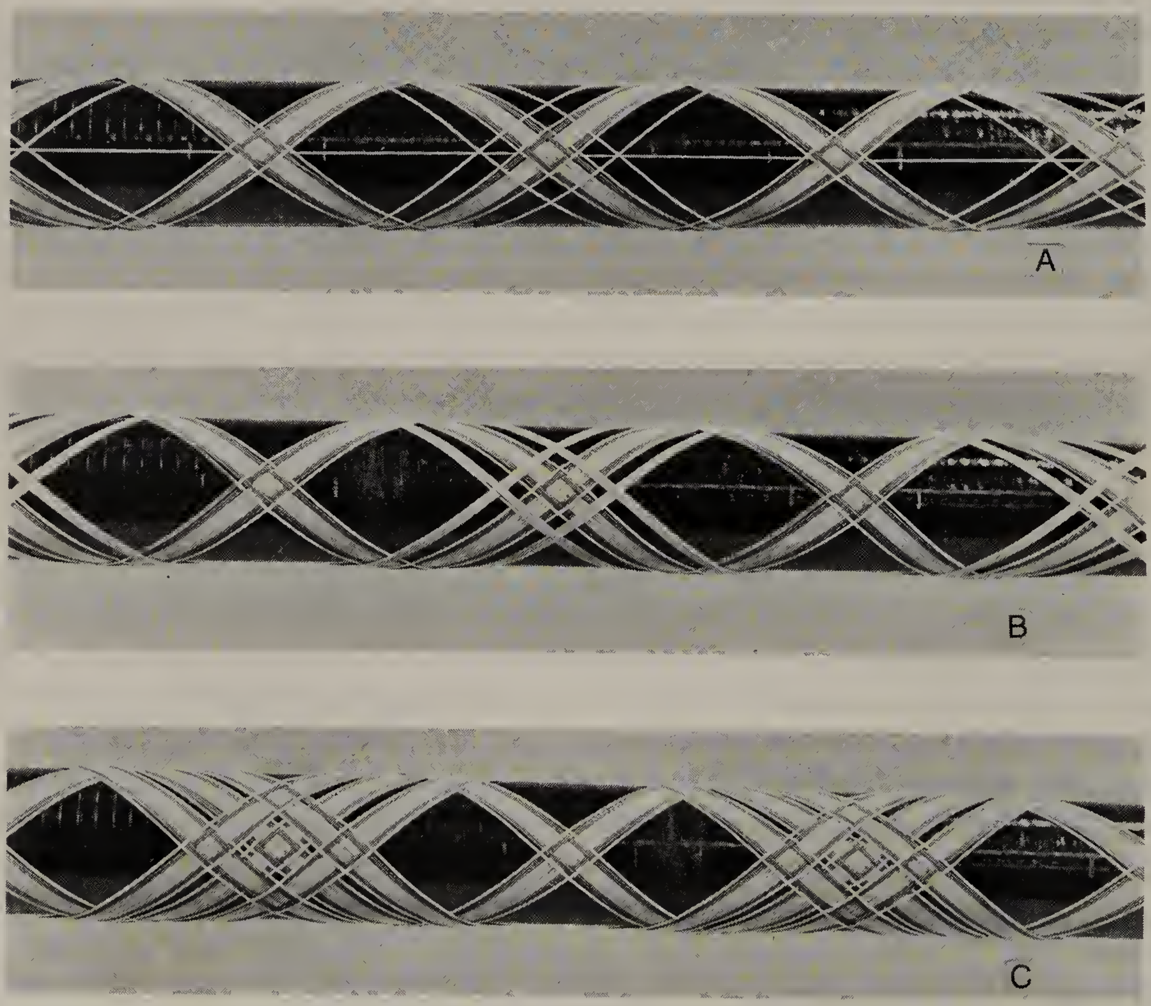
Visually the wrap consists of four small diamonds surrounding, but separate from, another identical diamond. This main pattern is alternated with small diamonds. From a construction standpoint it consists first of a double diamond wrap of small diamonds on four axes. Over top of this, on just two axes, is built the pattern of the four surrounding diamonds.

To make the wrap, first make the double diamond pattern, using small individual diamonds. Keep notes on the numbers of threads, their color, and their sequence so you can duplicate the pattern exactly in the balance of the wrap.

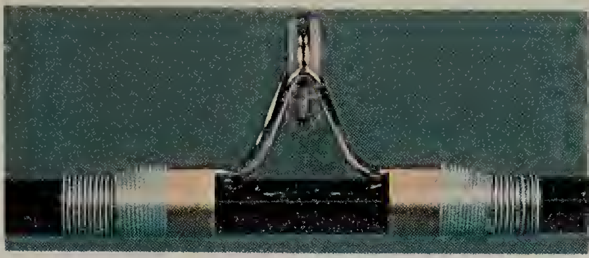
The border diamonds surrounding every other diamond in the initial wrap are formed by first spiraling a thread on each side of *one* of your original two diamond wraps. These threads must be the same color as the center thread used in your original pattern. Since they will be the center threads for your border diamonds, they must be placed far enough from the edges of the initial wrap to allow a space between the border diamonds and the center diamond *after* the border diamonds are completed. This means you must allow for the width of the border diamonds as they are wrapped on each side of the center thread. When wrapping these center threads, take care to keep this distance from the edge constant.

As we did when we wrapped the double diamond, it will help to label the center thread on one side #1 and the center thread on the other side #2. Refer to the notes you made on your initial pattern, and repeat the steps exactly. First wrap to the right of your #1 center thread, then to the right of your #2 center thread. Next, wrap to the left of #1, then to the left of #2. The sequence is the same as the one you used in making the initial double diamond.

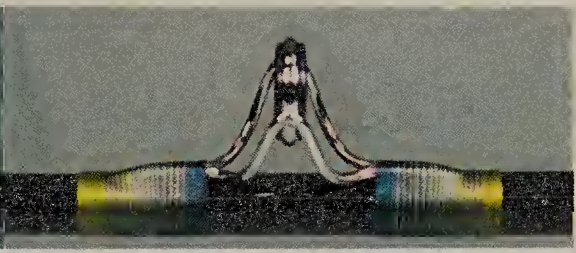
One of the variations possible is to eliminate the space between the border diamonds and the center diamonds. This can be done by carefully measuring the width of the band of thread forming the original diamonds. Place your center threads for the border diamonds one-half this width from the edge. The last thread on the outside edge of the border diamonds should then fit against the edge of the center diamonds. You will probably have to push some threads to one side, at spots, to make it fit. It will also be necessary to push the entire finished wrap together tightly with a pair of Thread Tools or your thumbnails.



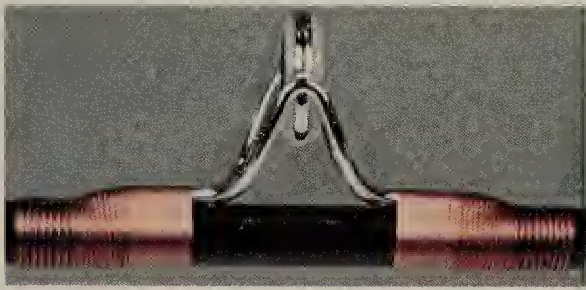
Diamonds surrounding diamonds. A: Small double diamonds completed, two center threads in place. B: Center bands of surrounding diamonds made. C: Completed wrap.



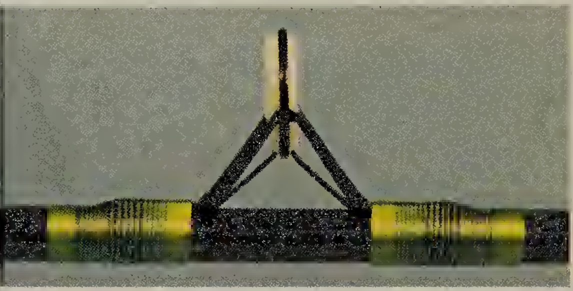
Multithread wrap of dark blue, light blue, and gun-metal silver.



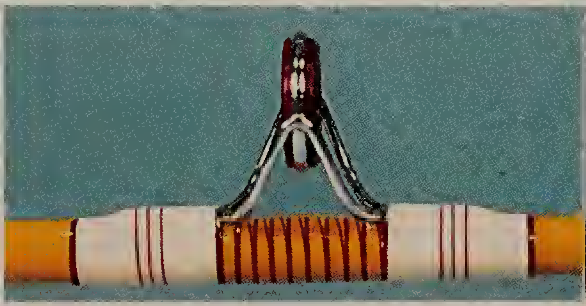
Multithread wrap of green to dark blue, with guide shock ring dyed blue.



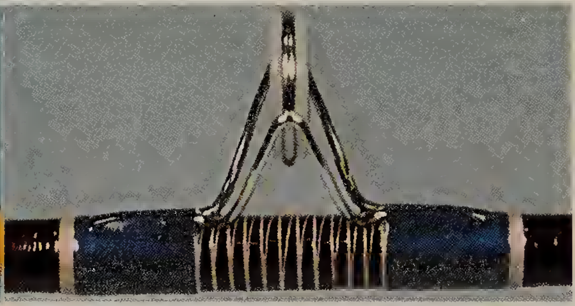
Multithread wrap of dark brown, brown, and beige.



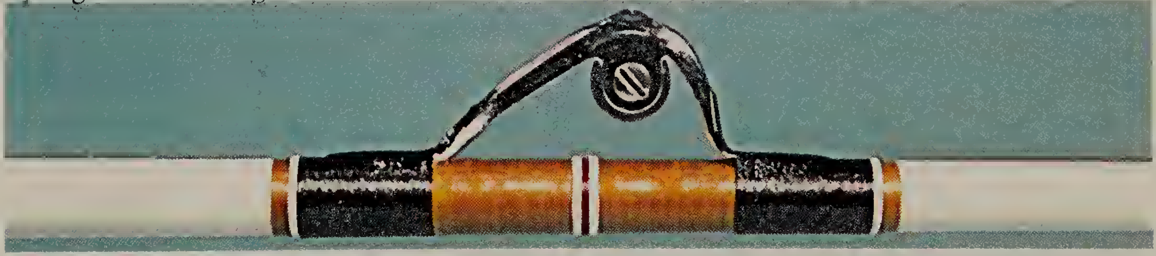
Multithread wrap of green, dark green, and black.



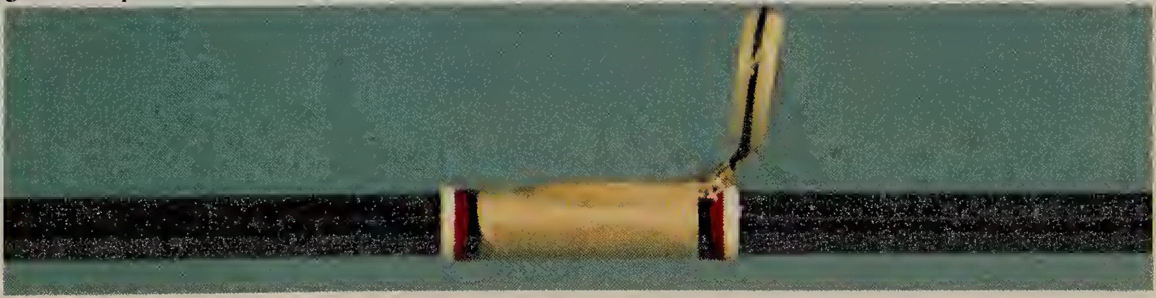
Single inlaid red thread spaced five threads apart. Artificial underwrap done in banded spiral fashion with matching red trim and dyed guide shock ring.



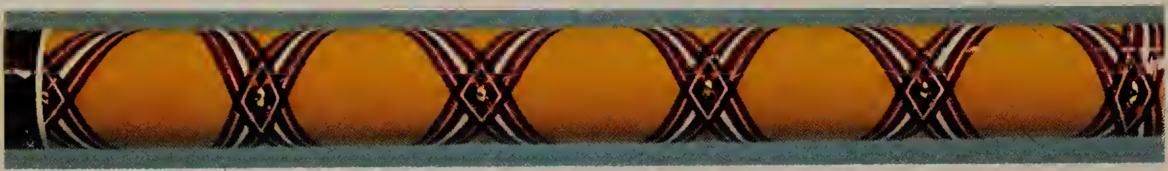
Banded spiral underwrap.



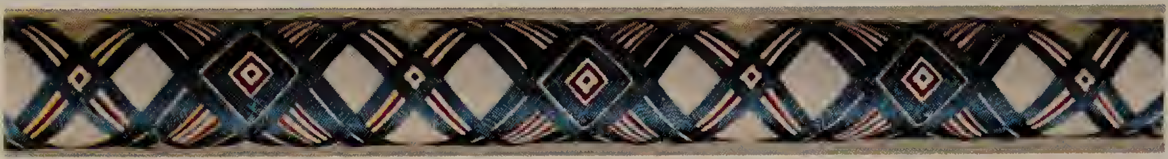
Gold metal underwrap with triple guide trim ring of white and red. White trim at end of black guide wraps.



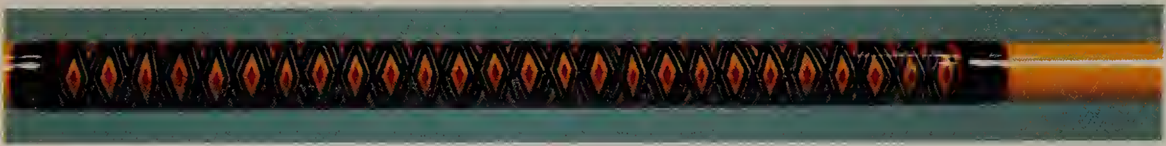
Triple trim bands of black, red, and white on each end of gun-metal silver single foot wrap.



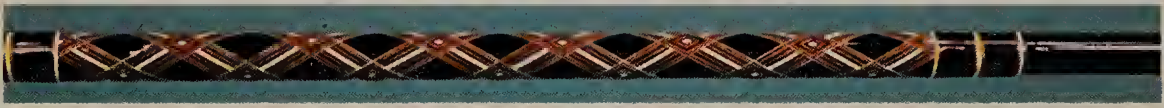
Transparent mylar diamonds done with no color preserver.



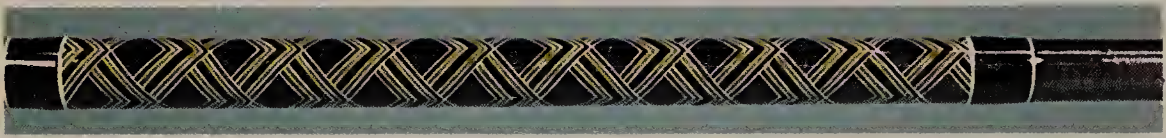
Single diamond wrap with small diamonds between.



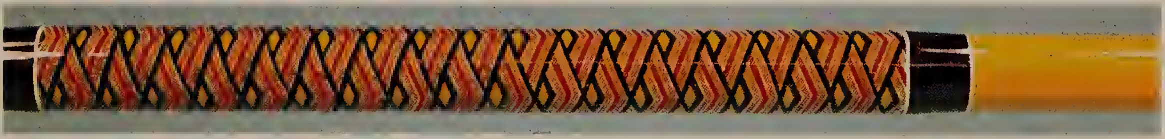
Line of diamonds of solid thread wrap done in black, gold metal, and red.



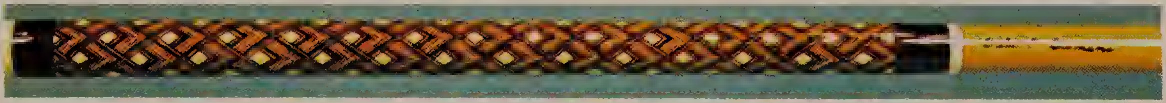
Typical double diamond wrap.



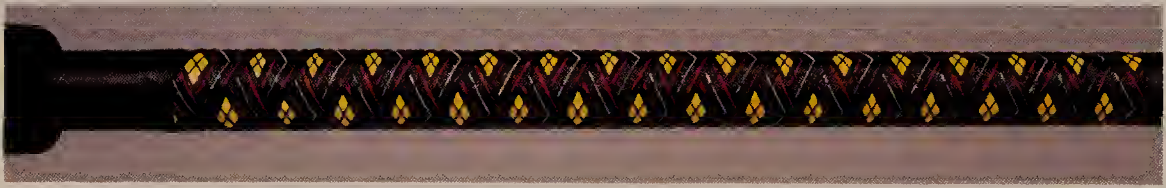
Typical double chevron of green, dark blue, and black with single white threads separating colors.



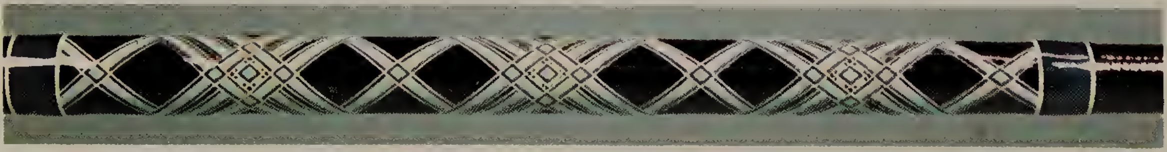
Double chevron done with very short spacing between centers. Gold metal, dark brown, and orange on gold blank.



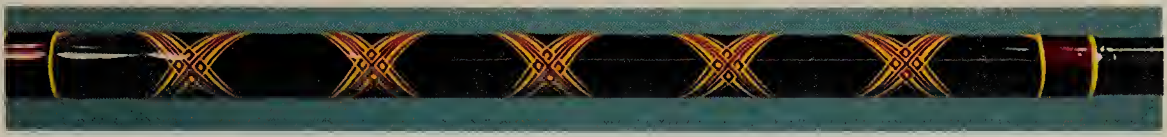
Chevrons done on eight axes to produce white diamonds from underwrap.



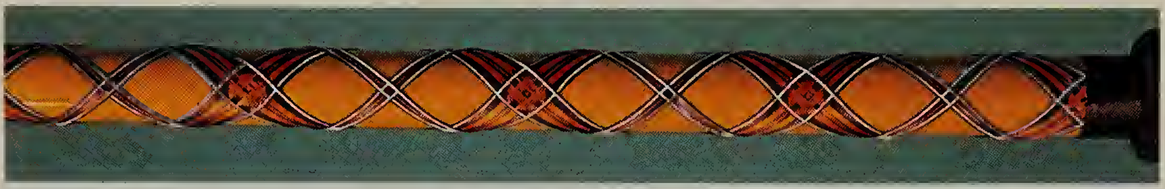
Double chevron on short spacing with single cross thread over centers of goldenrod diamonds showing through from underwrap.



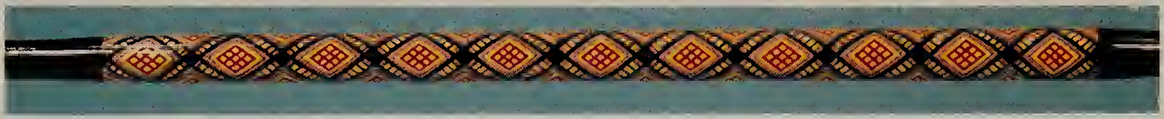
Diamonds surrounding diamonds on single pattern. The small center diamonds are done on a double pattern.



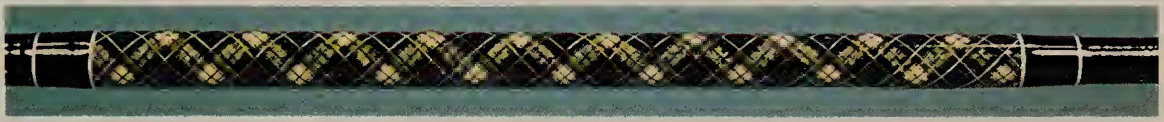
Single pattern of four diamonds.



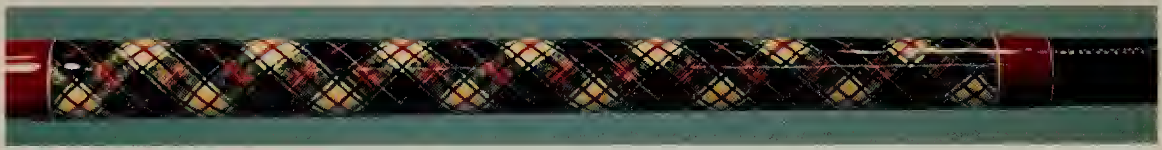
Split diamonds surrounding tiny center diamonds with no space between each. Small diamonds alternating in space between.



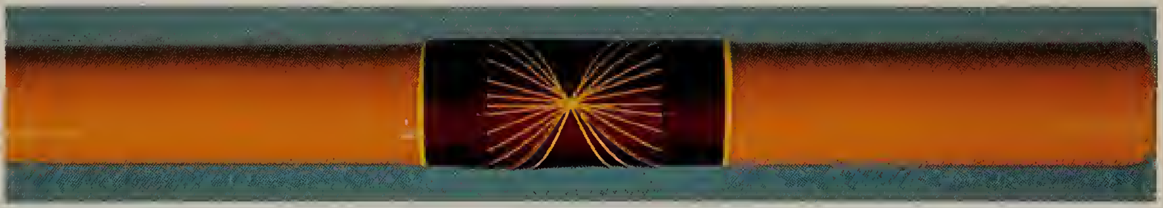
Snakeskin pattern.



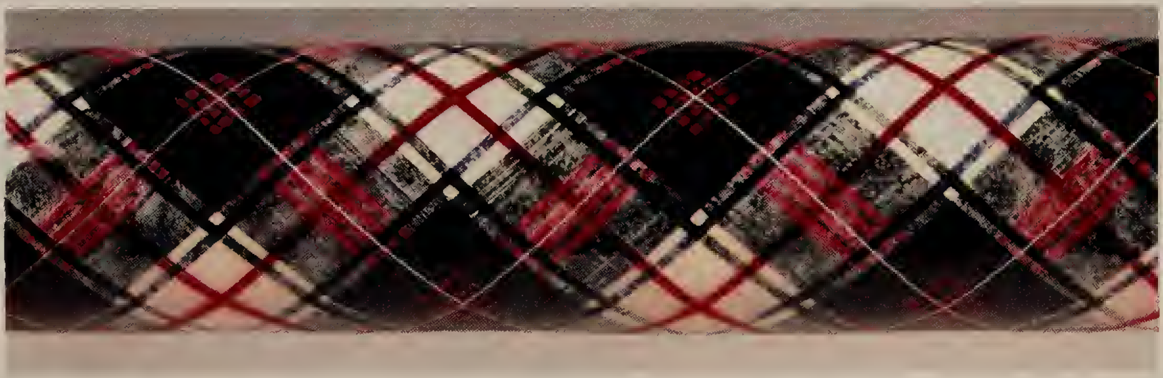
Tartan wrap.



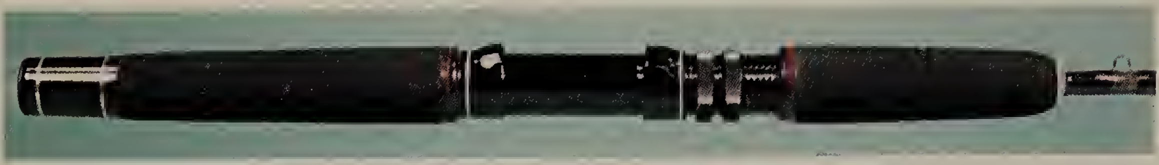
Tartan wrap.



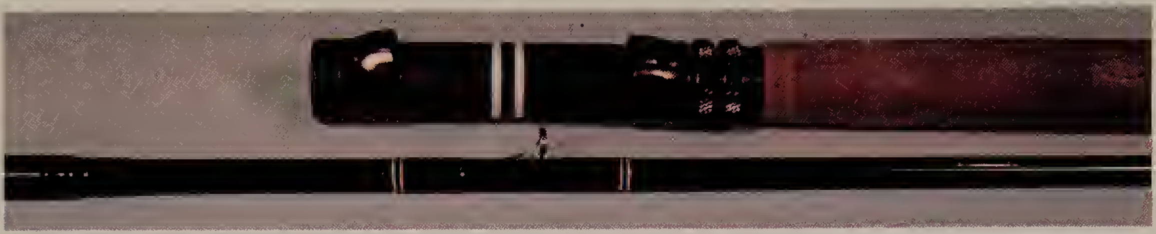
Radial pattern.



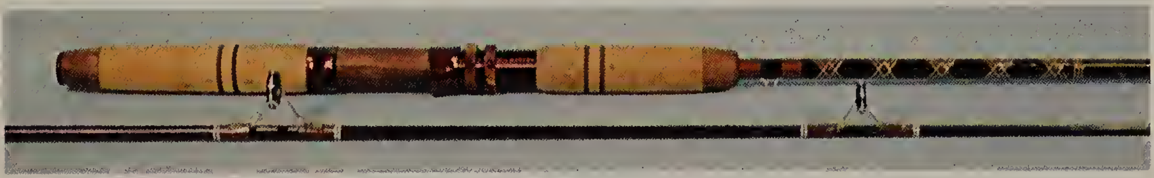
Tartan wrap.



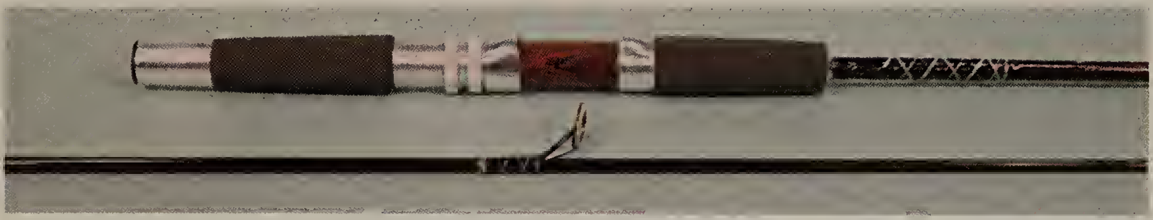
Handle assembly of Customgrip with Vee grooves, walnut trim rings, and reel seat and butt cap with Vee grooves cut through anodizing.



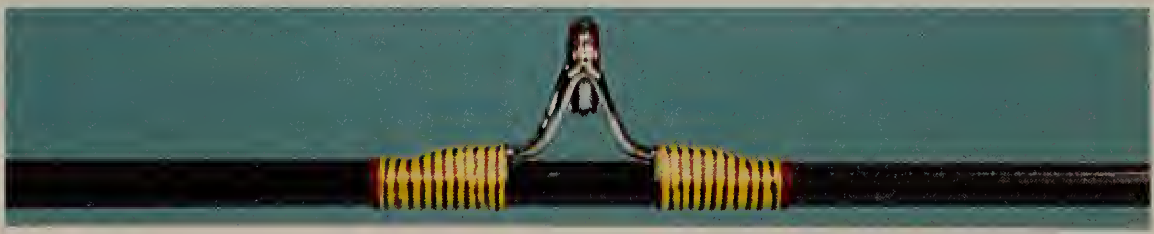
Walnut fly seat and matching walnut button. Center of seat inlaid with white and black plastic trim rings. Trim at end of guide wraps repeats theme of white, black, white.



Handle assembly with walnut insert in skeleton spin seat and matching walnut hosels. Cork has burnt-cork trim rings.



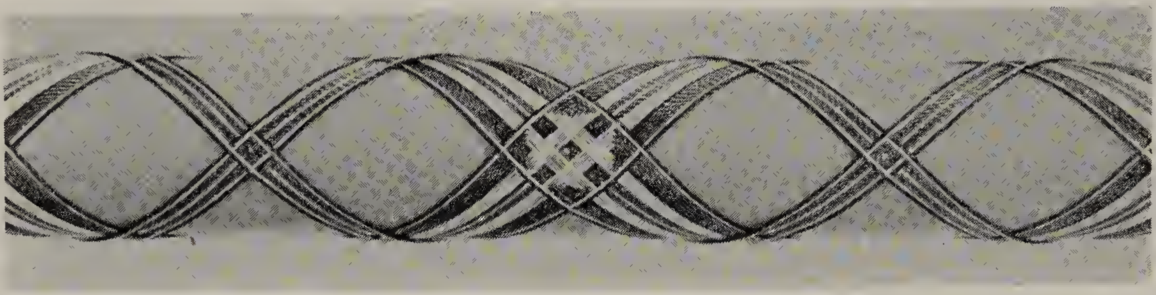
Handle assembly of polished skeleton spin seat (anodizing removed) and polished butt cap. Walnut insert and Customgrips.



"Amazing" wrap of red and black Flair pen markings on goldenrod thread. Guide shock ring dyed red.

Other variations would be to make the sizes of the individual center diamonds different from those of the border diamonds. They could be larger or smaller. Another possibility is to make the color pattern of the center diamonds different from the center diamonds. You can use the same colors, but change the pattern. Once again, if you understand the basic technique you can easily design your own unique wraps.

Let's take an example of combining techniques to design your own pattern. Obviously, the possibilities are endless. Pictured is a wrap featuring (1) small double diamonds, and (2) surrounded by split diamonds. No space was left between the two sets of diamonds since the split diamonds were wrapped until they touched the small diamonds. The split diamonds were wrapped so the light color was always on the side nearest the center and the dark color always on the outside.



Combining techniques. Split diamonds surround a small center diamond but no space is provided between diamonds.

Straight cross (reverse diamond)

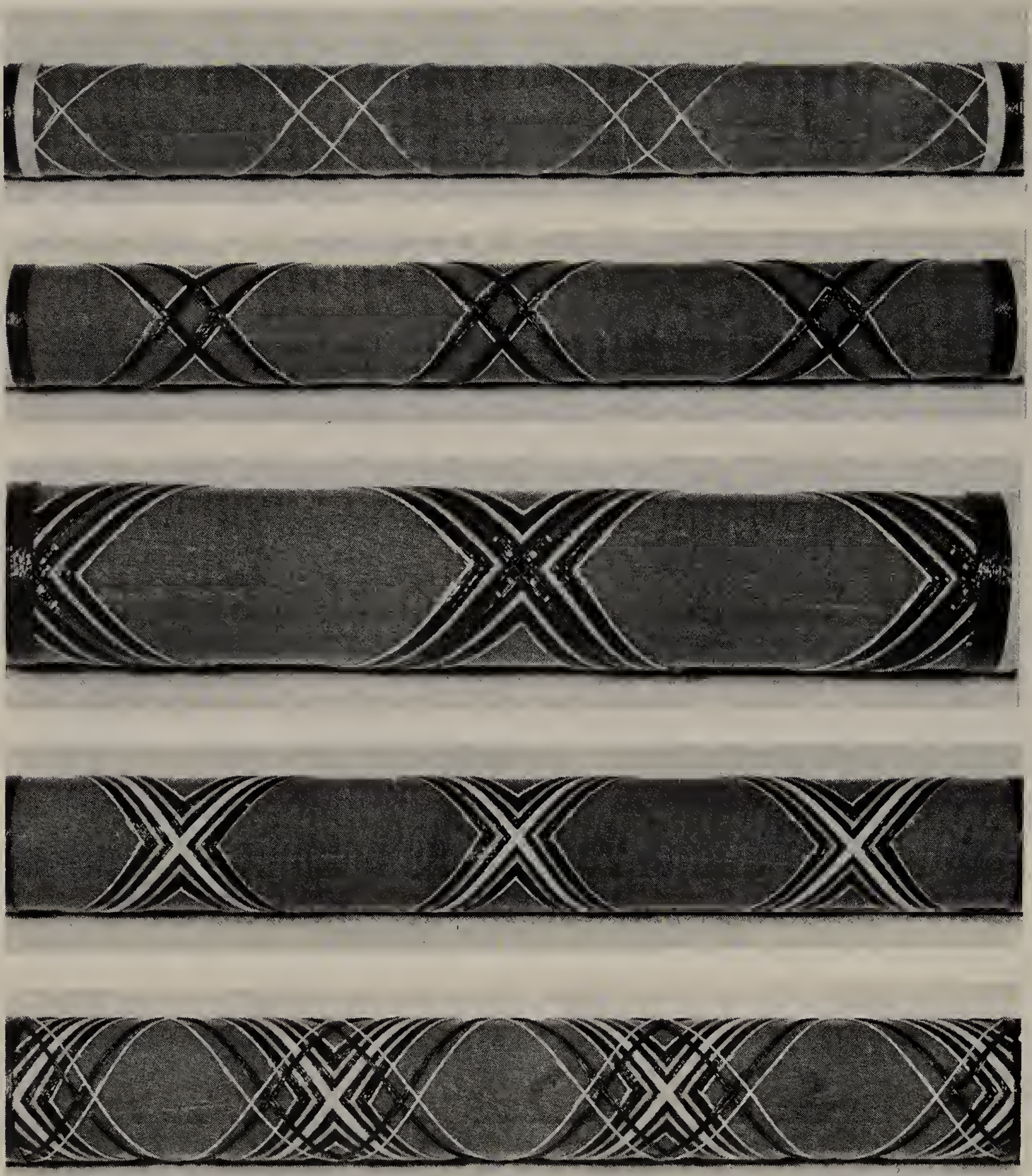
Regular diamonds are made by adding threads alternately to each side of a center thread. Or, to put it another way, we work from the inside (center) to the outside. If you are not already familiar with it, I would like to introduce you to a different technique that is fundamental to another series of wraps. It is working from the outside to the inside. That's why some people call it a "reverse diamond"—it is built in reverse order.

The simplest form is a straight cross surrounded by concentric crosses. Since you work from the outside toward the center, you will have to first spiral a pair of *parallel* threads up and back down the blank. These threads will become the outside edges of the pattern.

The wrap will be built by laying threads toward the inside of each of these threads. As in making a regular diamond wrap, a standard sequence is important. The first band of thread should border the upper thread (the one toward the tip of the rod), both going up the blank and coming back down. The second band, the same color and width as the first, should border the lower thread. Keep repeating this sequence, changing colors and widths of the band to form your pattern.

The wrap sequence shown in the photos was done by RodCrafter Sandy Stein. The pattern he used *on each side,* from the outside in, was: one yellow, four dark blue, two light blue, and three dark blue. At this point there was space for four more threads to fill the center. He used a band of two yellow threads spiraled up, then down the blank.

The addition of the final band of threads to fill the center can be a bit tricky. Before wrapping it, check the pattern to make sure there is enough space in the center at all points. If not, open the center by pushing the threads outward with a Thread Tool or your thumbnails. When the center is open, wrap the final band of thread in place. It may be



Straight cross (reverse diamond) wrapping sequence.

necessary to open the center more as you squeeze in the last threads. Now go over the wrap and push all the threads toward the center from each side. This will pack them tightly and eliminate any gaps.

The final photo shows an easy variation to dress up the wrap. It consists of some open diamonds placed over the top of the straight cross. Bands of dark blue and yellow were used.

Four diamonds

Now that you have the hang of working from the outside to the inside, let's move on to a bit more complex wrap. On this, four small diamonds, all touching together, are formed from one band of thread. At least that is the visual effect. From a construction standpoint, you build two diamond patterns side by side in the conventional manner (from the center of each, outward). However, they have been carefully spaced apart so that they come together in the center forming a straight cross as in the previous wrap.

Since each of the two diamond patterns is made in the conventional manner, you will need two center threads. They must be parallel. The wider the space, the larger will be the overall pattern. To determine this space you can measure the width of an existing normal diamond wrap, or you can make a test pattern on a card faced with double-stick tape as explained later in this chapter. From making my share of various wraps, I have found that nine Size A threads are 2mm wide. Perhaps this will be of help.

Lay out the pattern on the rod in the same manner as for the straight cross. After spiraling your two center threads up and down the blank, you will have an initial guide pattern similar to the one used for the straight cross. The difference will be that the two parallel threads will be a bit closer together. These, however, are center threads, so proceed to build a conventional diamond around each. As always, sequence is important. Add a band of threads to the right of the #1 center thread, then to the right of the #2 center thread. Repeat the process first to the left of the #1 thread, then to the left of the #2 thread.

Continue building the wrap until you get to the point where there is only a narrow space between the two patterns. As in the straight cross, open the center to accept the final band of thread both up the blank *and* back down. Work this band of thread into the wrap, then push all the threads together from the outside. This defines the shape and eliminates any gaps.

An observation may help in making both of these last two wraps. Work as carefully as you can, but do not be overly concerned about having the exact amount of space in the center to accommodate the last band of thread. It is better if the space is slightly larger than needed, since the final step of pushing the threads together toward the center will tighten everything and allow you to accurately form the outer shape.

Snakeskin (nine diamonds)

Sometimes I wonder if I'm the only rod builder who has a habit of giving his wraps pet names. The first time I made this pattern it was of brown, gray, and black, and to me it looked like snakeskin. So, that's what I labeled my notes, and that's what it has been to me ever since.

The appearance is of rather large diamonds, the centers of which contain nine tiny diamonds. Basically, it is made in a double-cross-wrap style of three conventionally built diamonds. The three lie side by side so that as they are built out from the center, they meet, forming one solid pattern. Borders are then added around this solid center to make large diamonds.

In our exploration of some specific wraps we have been more or less progressing from the simple to the complex. Let's pause a minute and see what combination of techniques is employed in making this wrap.

1. It is a double cross wrap with diamonds on four sides (0°, 90°, 180°, and 270° axes). We therefore will be making two wraps simultaneously.
2. There are three center threads to each individual pattern, and diamonds are built conventionally (from the center out) around each center thread.
3. Careful spacing between the three parallel center threads is necessary so the pattern fits together.
4. Since the three parallel diamond patterns meet, there are two center spaces into which final bands of thread must be fitted. (There was only one such center space in the previous four diamonds pattern.)

You can use the Butt Wrap Alignment Tool in a number of ways to lay out patterns such as this that have other than a simple cross. You still need to measure and mark the centers, as explained before. If you want two more layout threads, one on each side of the center thread, you might choose simply to spiral them on the blank by eye. After they are taped down, go back and use a Thread Tool to move the threads slightly so they are always parallel with the center threads. The other approach is to carefully measure on each side of the center and mark the blank along each axis.

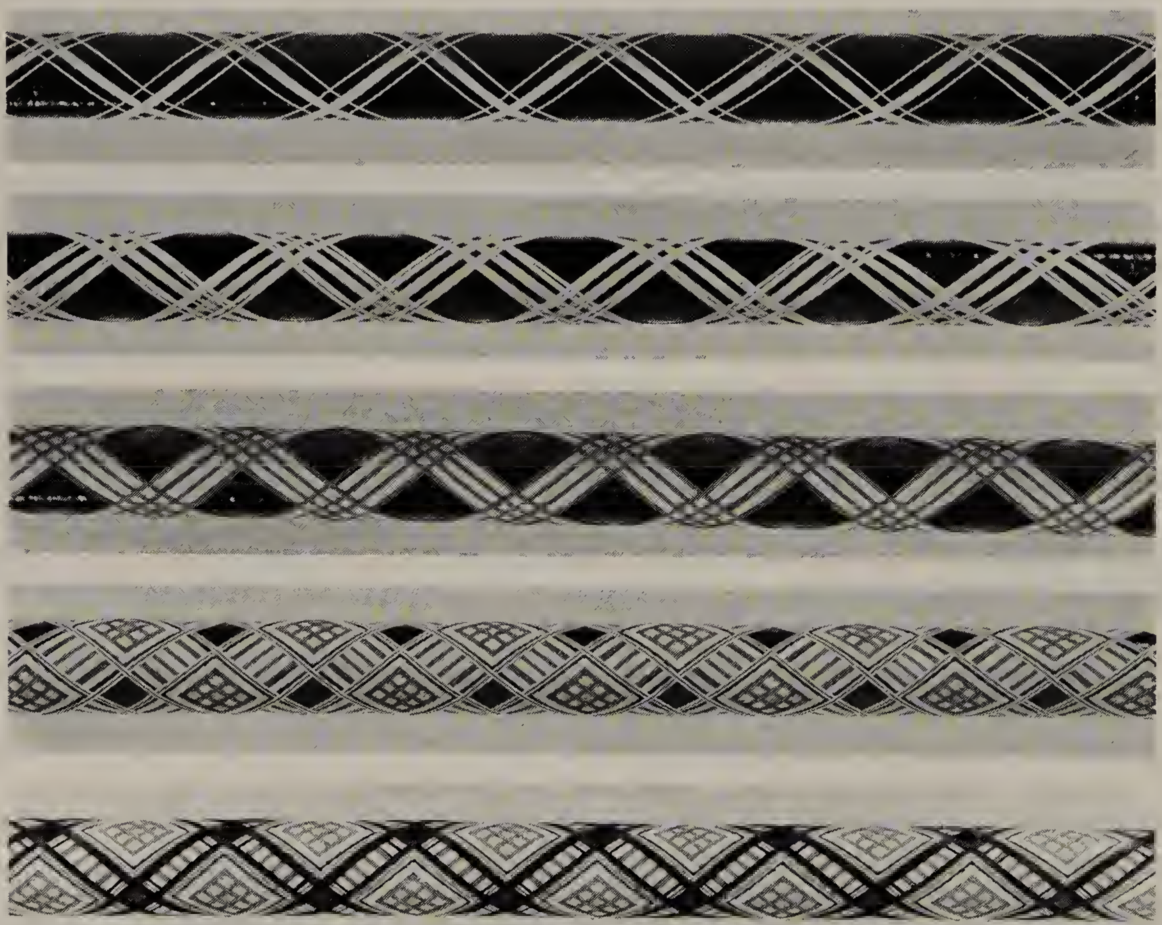
The layout for this wrap will consist of three center threads. This is a double wrap, so there will be centers marked on all four axes. Spiral three sets of (center) threads up and back for one wrap and three sets up and back for the other wrap.

Starting with the middle center thread on the #1 wrap, place a band of thread on each side. Move over the #2 wrap and repeat the process. The first photo in the sequence shows the wrap at this stage.

Add bands of thread on each side of the uppermost center thread on the # 1 wrap. Shift over to the #2 wrap and do the same. Now add bands on each side of the center thread nearest the butt on the # 1 wrap, and repeat on the #2 wrap. This is the stage pictured in the second photo.

A darker color (I used red) is chosen to complete and define the tiny diamonds. The number of threads used will be determined by the space remaining that must be filled. Before wrapping make sure the center spaces are opened sufficiently throughout the wrap. Add the dark bands to the center spaces *and* to the outside. This forms the nine tiny diamonds. Push all threads tightly together. The result is shown in the third photo.

From this point on you treat the wrap the same as any double diamond. Add a border of light-color thread by alternating first to the right of the # 1 wrap, then to the right of



Snakeskin (nine diamonds) wrapping sequence.

the #2 wrap, followed by the left of the #1 wrap and the left of the #2 wrap. Following this sequence add individual threads, or bands of thread, until the diamonds are of the size desired. The fourth photo shows all but the last border in place.

This wrap generally looks best if the size of the diamonds is rather large. On the example pictured I added a final band of four black threads. Since the blank was also black, this tied the pattern together nicely. The final result is seen in the last photo.

Tartans

We mentioned earlier that we can get a more or less plaid effect by adding bands of thread to the open spaces between individual diamonds, and even by adding some directly on top and through the center of individual diamonds. This effect can be quite interesting and beautiful.

Actual plaid fabric, on the other hand, is made by weaving different-color threads at right angles. This weaving produces a pattern that is dark (where dark threads cross with dark threads), light (where light threads cross with light threads), and a color halfway between (where dark threads cross with light threads). You can see this by examining a piece of plaid cloth. The mixture of light and dark colors, or "bleeding" of the two colors, is the problem in making plaid or tartan butt wraps.

Tartan, incidentally, refers to the specific plaids woven originally by the Scottish Highlanders, where each clan had its own pattern. Personally, I have always been attracted to these tartans with their rich heritage. They are true classics and will always endure. Some of the patterns are frequently used in more expensive clothing, and the connotations seemed ideal to me for custom rod work.

My own experience has been that the best way to wrap a facsimile of a tartan or any plaid is to have an example in front of you. I use articles of clothing, but you can also get books and charts in full color. By studying the tartan, you can determine the proportions of the various parts of the design, as well as the colors used.

To reproduce the bleeding effect of a mixture of light and dark threads, we need to fall back on a technique of threadwork discussed earlier. When we talked about making transparent mylar diamonds, we found that if no color preserver is used on regular thread it becomes transparent. We also found that NCP thread with no color preserver remained opaque. In making a tartan we will make creative use of these characteristics. No color preserver will be applied to the wrap, just the wrapping finish.

A tartan wrap is made in two layers. The first is entirely of regular thread, and this is where the bleeding of colors takes place. The second layer, wrapped on top, consists only of a few trim threads. If medium or dark colors are used as trim threads they can be regular thread. However, any light-color trim threads must be NCP to remain opaque.

To obtain the necessary bleed of colors in the first layer, *regular white* (not NCP) is wrapped over darker colors. When the wrapping finish is applied, the white becomes transparent enough to lighten the darker colors underneath. You're probably saying, "That's fine for the bleedthrough of darker colors, but how do you keep the regular white thread white when there is nothing but the blank beneath it?" The answer—paint the blank underneath the wrap white. Then, the transparent white regular thread will allow the white paint to show through. You must use white wrapping underpaint, or a white latex or acrylic paint. Otherwise, the solvents in the wrapping finish will lift the paint and ruin the wrap.

The first step, then, is to determine the length of the tartan wrap alone (without the binding base wraps). Measure this on the rod, in the proper location, and scribe two circles. Paint a full coat of white underpaint between the circles. It dries and can be wrapped over in fifteen minutes to a half-hour. Measure and make note of the distance from the end of the foregrip to the nearest edge of paint, and also the length of the painted area. You will need these measurements later.

The wrap is built around a double diamond wrap, so place your threads accordingly and spiral the desired center colored threads up and down the blank. Start building your wrap in the normal sequence for a double diamond. The first photo shows the painted section of the blank with the initial bands of thread attached over double-stick tape.

As you build your diamond pattern, concentrate on reproducing only the main background of the tartan—the portion where the bleedthrough of colors occurs. Do not be concerned with the fine trim lines, since they will be added afterward on top of the first layer.

When you examine a tartan closely you will frequently find that the colors woven at right angles are not always the same in each direction. This was true in the tartan reproduced in the wrap photographed. The medium-color bands were green, but the darker lines in one direction were black while those at right angles were blue. Unfortunately, a black-and-white photograph reproduces blue and green as just about the same shade of gray. All the threads forming the dark bands were black when spiraled up the blank, but the same bands were blue when spiraled down the blank.

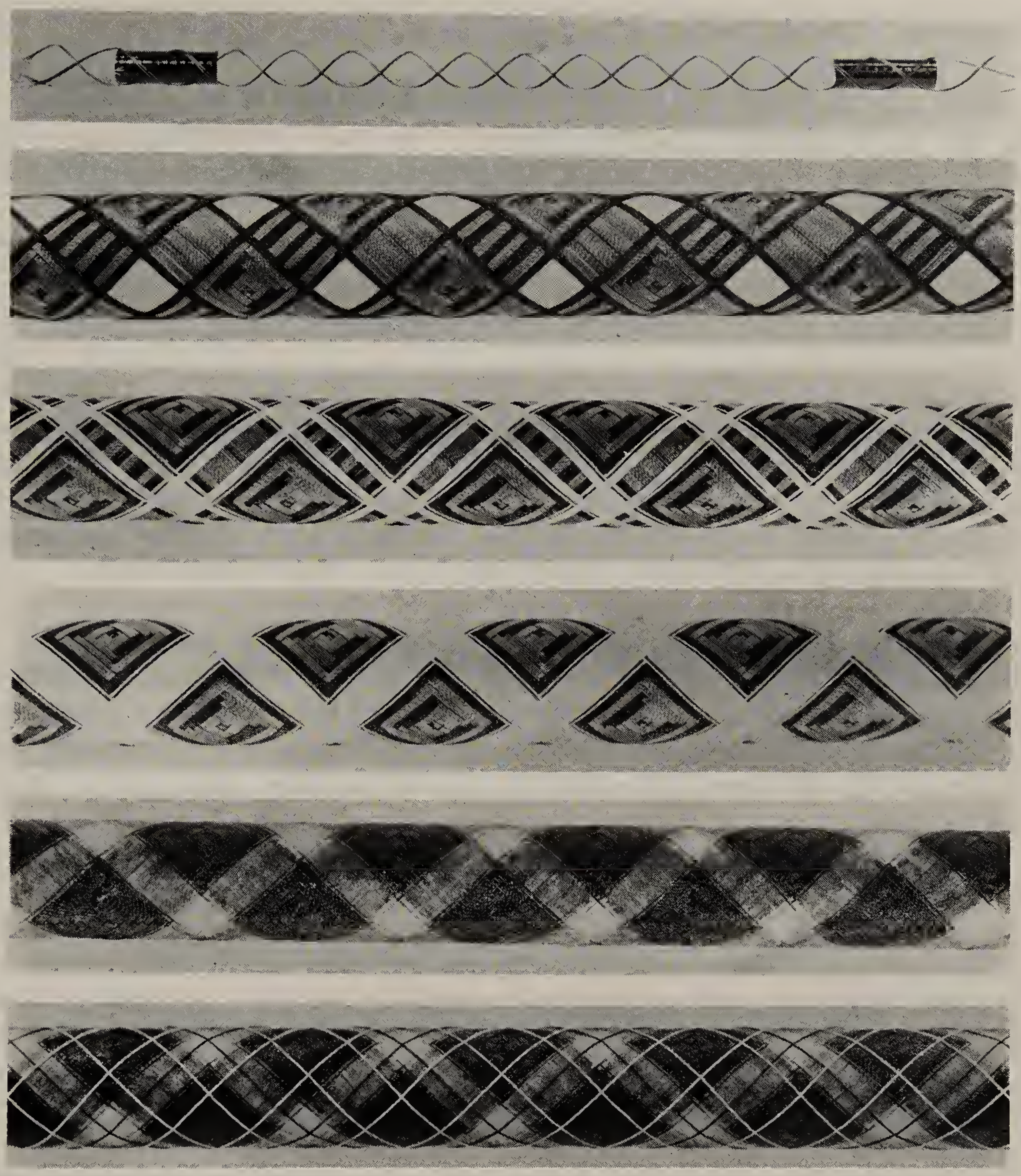
Build your diamonds to resemble the dark portion of the tartan as closely as possible. Study not only the pattern, but the relative proportions of the overall dark area to the light area. When the dark area is complete, stop and push all the threads tightly together. This is the stage of the wrap shown in the second photo.

From here on you use *regular* white thread and keep adding bands around the outside of the diamond pattern. The third photo shows the initial white bands in place. White thread is added until all space between the diamonds is completely covered. You will reach a point where only a narrow space exists between patterns. Quite probably the space will not be exactly the same throughout the wrap. You will have to open this space by pushing against the threads as explained in previous wraps. The size of the remaining space determines how many white threads are needed to fill it. Don't be concerned if the space along one spiral needs more threads than another. Use whatever number of threads are needed and push and shove until all is covered with white thread. In particularly tight spots, push the point of a Thread Tool directly ahead of the last white thread to open a space for it. The fourth photo shows all of the white threads in place.

You are now ready to apply the wrapping finish to create the desired bleed of colors. Please note this *must* be a thin-consistency finish such as Crystal Coat two-part epoxy. You need complete penetration of all the Size A threads, and the finish must be thin enough to displace air trapped among the wrappings. Heavier epoxy and polymer finishes will not do the job.

Since you have completely covered the blank with thread, you will no longer be able to see where your white underpaint is located. Refer back to your previously made notes to find the distance from the end of the foregrip to the edge of the white paint. Hold a ruler so that the end is against the foregrip. At the proper distance for the edge of the underpaint, brush a coat of your finish around the blank by rotating the rod with the ruler held in front. Follow the same procedure for measuring the opposite end of the underpaint. Cover the entire wrap between these two points with a coat of your finish. As it is applied you will see the color bleed through the white thread. Your wrap will now look similar to the fifth photo. Allow the finish to cure completely.

The next step is to add the trim lines. These are wrapped over the existing pattern. Mostly they will be single Size A threads. Only on large-diameter blanks will some of



Tartan wrapping sequence.

them consist of a very narrow band of thread. Medium and dark colors can be regular thread, but light colors must be NCP. It should be pointed out here that there are too many lines in some acutal tartans for reproduction on a rod. If all of them were added, the wrap would contain too much detail and the overall pattern would become lost in a maze of thread. Select only the significant ones to create the desired effect.

The completed wrap is shown in the sixth photo. Use no color sealant. Just apply the required number of coats of wrapping finish to provide a smooth coating.

Cross-wrap summation

We have discussed the method for laying out any type of cross wrap and explored some specific wraps. The wraps used were selected to provide us with examples of different techniques. By now it should be obvious that the number of variations possible is limited only by a rod builder's imagination. Each of the techniques can be combined in different ways to design a multitude of wraps. I hope I have opened the door a bit farther to the creative design of your own cross wraps.

I think it is safe to say that most of us do not simply want to be imitators. So much of the fun of threadwork is found in creating. The really outstanding wraps are not necessarily the most complicated. Instead, they are outstanding because a perfect sense of proportion in the design is combined with a tasteful, pleasing use of color.

WRITING WITH THREAD

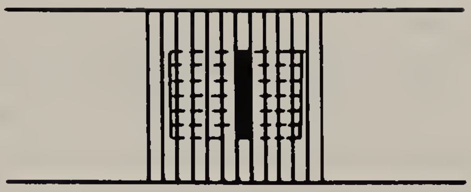
Have you ever noticed how some people look with awe at a name written in thread on a rod? To a certain group this is the epitome of thread craftsmanship. I would certainly agree that it adds distinction and substantiates the custom builder's skill in using thread. However, I believe there are many other wraps that call for more artistic talent in the use of pattern, proportion, and color. Nevertheless, writing a name in thread is a technique that all rod makers should be able to call upon. It is a unique custom touch.

I am deeply indebted, here, to RodCrafter Bill A. Heckman for sharing not only his methods, but his extremely valuable thread position table. This provides step-by-step directions for forming every letter in the alphabet, as well as numbers. It represents a great amount of work on his part, and will save the rod builder countless hours of trial and error. There are those who would jealously guard such a laboriously developed tool. It is a tribute to Bill and other RodCrafters like him who willingly share so that the art of custom rod building may be furthered and enjoyed by all of us.

"Alphabetizing with thread," as Bill calls it, is not particularly difficult. What it does require is attention to detail, and a measure of patience until one becomes familiar with the process. The basis of the technique is composing block letters generally with a 7:6 ratio. This forms most letters seven threads high and from two to seven threads wide. Using Size D thread you will get about twelve letters to the inch, depending, of course, upon the make-up of the characters. With seven Size D threads the letters will be about ⅛ inch high. A space of three winds of thread between letters works well, as does a space of six winds between words.

The technique is really one of weaving. A band, seven threads wide, is laid along the axis of the blank. These individual threads are woven in and out among the normal wrapping thread. Wrapping progresses from left to right. The weaving threads (which form the letters) are woven over and under the wrapping thread each time one wind of the wrapping thread is made. When a weaving thread is placed on top of the wrapping thread it is visible and forms part of a letter. When a weaving thread is placed under the wrapping thread (by winding over it), it cannot be seen. The block letters are thus formed of individual weaving threads passing over the top of the regular winding thread. In some cases the weaving thread will be on top for only the width of one wind of the wrapping thread. In other cases it will be on top of a number of winds of the wrapping thread.

A simple example will illustrate this process. Let's suppose we wanted to make the numeral 1. This consists of a straight line the height of all seven weaving threads, and it is only one wind of the wrapping thread wide. With the seven weaving threads firmly anchored by previously wrapping over them (and therefore not visible), we would bring all seven threads to the left. This allows us to make one wind of the wrapping thread around the blank. The band of seven weaving threads is now placed over the top of the wind just made by moving them to the right. They are now on top of the wrapping thread and visible. To make the weaving threads "disappear" we again wrap over them with the wrapping thread. This is shown in the accompanying drawing.

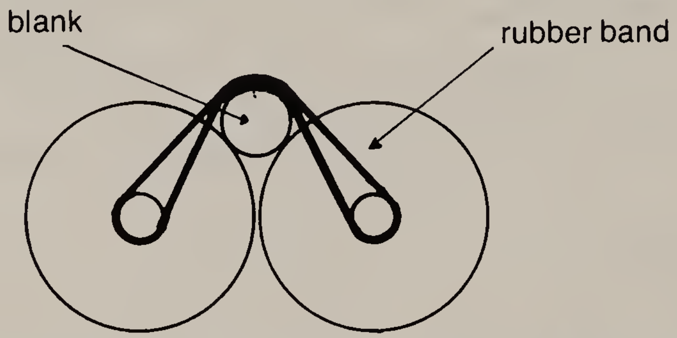


Numeral I is one wind of wrapping thread wide. Dotted lines show wrapped-over band of seven weaving threads.

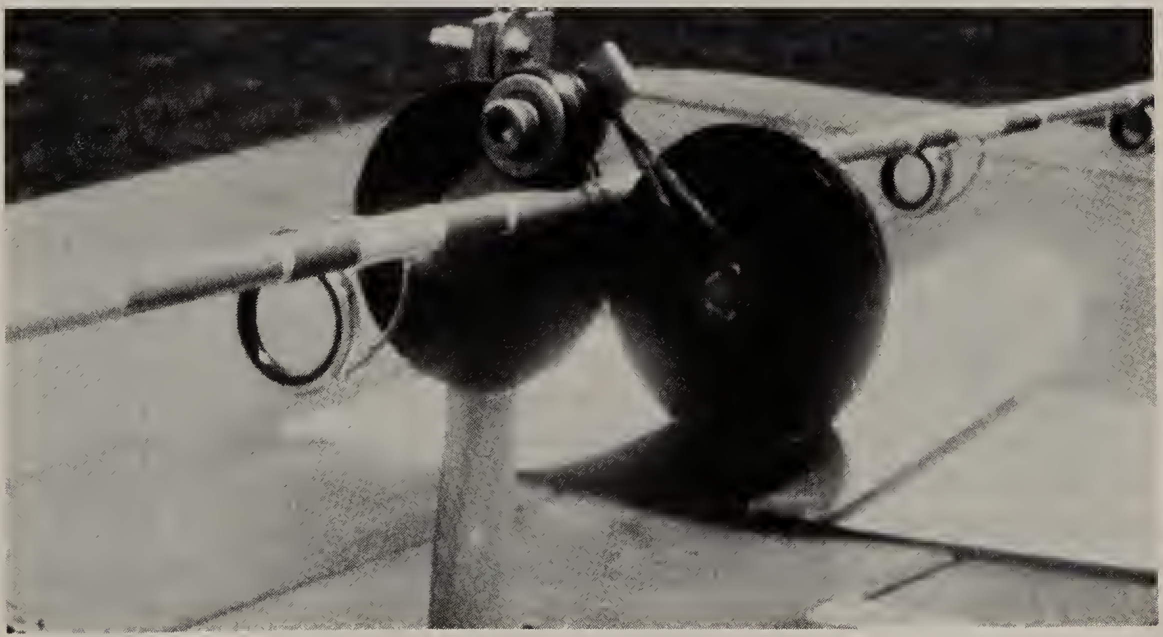
From this example we can conclude that when we move a weaving thread *to the left* it will be on top of the wrapping thread. It will remain on top, and visible, for as many winds of the wrapping thread as we leave it on the left. Conversely, when we move a weaving thread *to the right* it will be under the wrapping thread. It will remain underneath, and invisible, for as many winds of the wrapping thread as we leave it on the right. So remember:

Left—on top—visible
Right—underneath—hidden

These are the principles. Now, let's fill in the necessary details of this fascinating technique. Since you will need to have both hands free, your rod-wrapping supports will have to be set up to hold the rod stationary with the wrapping thread under tension. If you



To hold blank stationary, a rubber band can be stretched over blank and atached to each roller axle support.



Third roller, under tension from elastic, holds rod stationary for weaving.

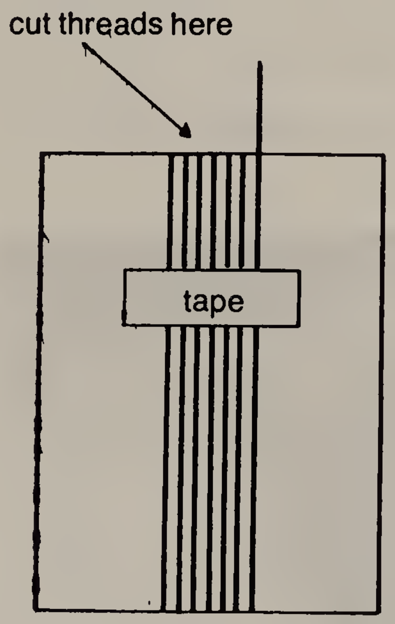
use one of the many forms of rod roller wrapping jigs, you can easily modify it for this one kind of threadwork. A rubber band can be placed over the axle supports of the rollers, on your left side, and stretched over the top of the rod (see drawing). When you want to rotate the blank, pull up on the rubber band with your left hand and rotate the blank with your right. Another possibility is to place a third roller with a center groove in the rim on top of the blank, and attach it to the other rollers with elastic. This is the arrangement Bill Heckman uses and is shown in the photo of his rig.

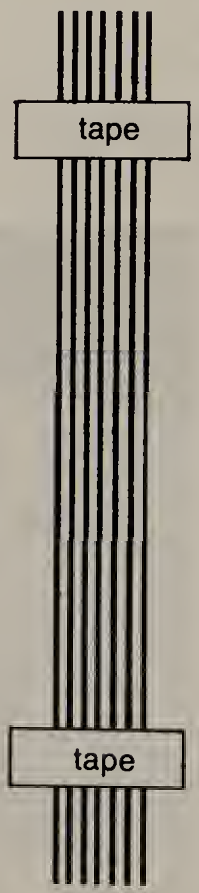
Start the basic wrap into which your letters will be woven. Stop about ten turns short of where you want the first letter to start. At this point you will wrap over the ends of the seven weaving threads.

The easiest way to prepare the weaving threads is to first wrap a single thread of the desired color seven times around a 4- or 5-inch piece of cardboard. Wrap them tightly against each other so they form a neat band. On *each side of the card* place a piece of masking tape across the threads, about 1/4 inch from the edge. Now cut the seven threads in a straight line along the edge (see drawing). Presto, you now have a band of seven individual threads held together at each end with a piece of masking tape. Carefully peel the tape from the card without disturbing the position of the threads.

To tape the band of weaving threads on the blank, hold it along the axis of the blank to the right of your previously started basic wrap. Place it so the ends of the threads are almost against the edge of your basic wrap, and tape that end to the blank. Keeping the threads straight, lay the band to the right and tape the other end to the blank. Now, continue your basic wrap (with a little extra thread tension) by wrapping over the ends of the band of weaving threads. When you reach the tape, peel it away carefully so you do not pull any of the threads out from under the wrap just made. Continue the wrap until you reach the point where you want the first letter to start.

For convenience and reference we will number the seven weaving threads from #1 at





Above: Band of weaving threads prepared by making seven wraps around a card. Pieces of masking tape placed across threads near one end and on each side of card. Cut band of thread at end.
Right: Band of weaving thread after cutting from card.

the top to #7 at the bottom. Bill has worked out the weaving pattern on his thread position table. Let's examine this blueprint for writing in thread. Across the top you will find columns headed by the number 1 through 8. These rperesent the individual winds of the regular wrapping thread that are used in making the width of each letter. Along the side are listed each letter in the alphabet, as well as numerals. Each box shows the position of each of the seven weaving threads. "L" means those numbered threads are taped ot the left, and "R" means those numbered threads are taped to the right—for that particular individual wind of wrapping thread. The designation "do" (ditto) means to leave the weaving threads in the same position as the previous block, and make one wind of wrapping thread.

Earlier we explained how the numeral 1 is woven. Let's check it against the table. Referring to the table we see that the block in the first column opposite the numeral 1 indicates "1-7L." This means that threads #1 through #7 (or all of the threads) are moved to the left, then the first wind of wrapping thread is made around the blank. The second column, opposite numeral 1, indicates "17R." This instructs us to move threads #1 through #7 to the right (over the wind of wrapping thread just made), and to make another single wind of wrapping thread around the blank. The remaining columns are blank indicating that the numeral is now complete.

As you follow the instructions in the table, always use this sequence:

1. First move the designated threads to the left or right.
2. Make one wind of the regular wrapping thread around the blank.
3. At the completion of a letter make three winds of wrapping thread around the blank (and over all seven weaving threads).
4. At the completion of a word make six winds of wrapping thread.

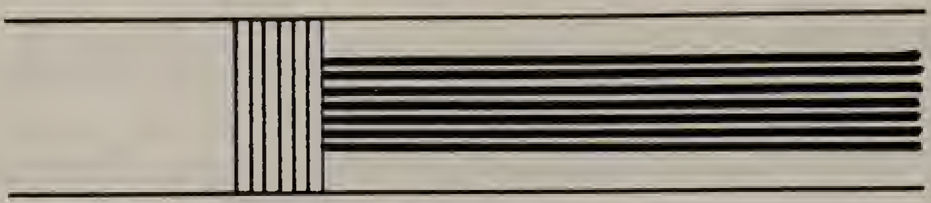
Let's take another example to make sure we understand the table and the process. At the start of any letter all seven weaving threads will have been wrapped over and will be taped to the right. To make the letter A, untape threads #1 through #7 and bend them to the left as indicated in Column 1. Straighten them out along the blank and tape them at their ends. Make one wind of wrapping thread. Next, as instructed in Column 2, leave threads #1 and #4 taped to the blank on the left. The remaining threads, #2, 3, 5, 6, and 7, are moved over to the right, straightened, and taped to the blank. Make one wind of wrapping thread. Column 3 indicates "do," so we leave the threads in the same position and make one wind of wrapping thread. The same instructions are given in Columns 4 and 5, so we would make one wind of wrapping thread for *each* of those columns. Column 6 tells us to move all seven weaving threads to the left. Make one wind of wrapping thread. Finally, Column 7 indicates that all seven threads go to the right. Since this is the end of a letter we would make three winds of wrapping thread (over the top of the seven weaving threads). We would then be ready to start the next letter. This sequence is shown in the drawings.

Got it? Good. Let me see if I can add a few helpful hints. At the beginning of the wrap when making the first part of the first letter, do not pull too hard on the weaving threads or you may pull them out from beneath their binding wrap. After you have the first letter almost formed (depending upon its width) you can gently pull any slack out of the winding threads composing the letter. The longer the wrap becomes, the more the weaving threads are bound and locked into position. You can then safely apply enough tension to pull the thread tight before taping them to the blank.

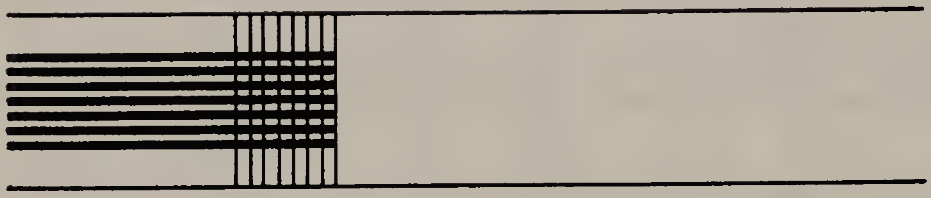
You will need a method of holding the weaving threads in a parallel band along the axis of the blank as you move them back and forth left to right. The method selected

	1	2	3	4	5	6	7	8
A	1-7L	14L 235 67R	do	do	do	1-7L	1-7R	
B	1-7L	147L 235 6R	do	do	do	234 56L 17R	1-7R	
C	1-7L	17L 234 56R	do	do	do	do	1-7R	
D	1-7L	17L 234 56R	do	do	do	2345 6L 17R	1-7R	
E	1-7L	147L 235 6R	do	do	do	do	1-7R	
F	1-7L	14L 235 67R	do	do	do	do	1-7R	
G	1-7L	17L 234 56R	do	157L 234 6R	do	156 7L 234R	1-7R	
H	1-7L	4L 1235 67R	do	do	do	1-7L	1-7R	
I	145 67L 23R	1-7R						
J	156 7L 234R	157L 234 6R	17L 234 56R	1-7L	1L 234 567R	do	1-7R	
K	1-7L	4L 1235 67R	do	35L 124 67R	26L 1345 7R	17L 234 56R	1-7R	
L	1-7L	7L 1234 56R	do	do	do	do	1-7R	
M	1-7L	12L 345 67R	3L 1245 67R	45L 123 67R	3L 1245 67R	12L 345 67R	1-7L	1-7R
N	1-7L	12L 345 67R	3L 1245 67R	4L 123 567R	5L 1234 67R	67L 1234 5R	1-7L	1-7R
O	234 56L 17R	17L 234 56R	do	do	do	234 56L 17R	1-7R	
P	1-7L	14L 235 67R	do	do	do	123 4L 567R	1-7R	
Q	234 56L 17R	17L 234 56R	do	157L 234 6R	167L 234 5R	234 567L 1R	7L 1234 56R	1-7R
R	1-7L	14L 235 67R	do	145L 236 7R	146L 235 7R	123 47L 56R	1-7R	

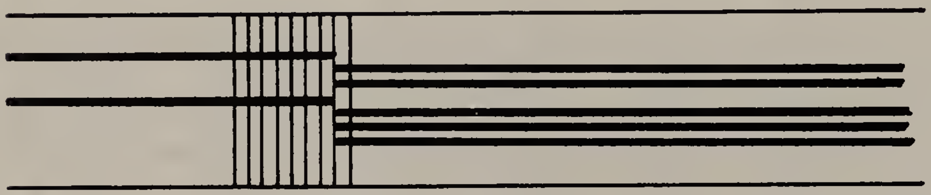
	1	2	3	4	5	6	7	8
S	123 47L 56R	147L 235 6R	do	do	do	145 67L 23R	1-7R	
T	1L 234 567R	do	do	1-7L	1L 234 567R	do	do	1-7R
U	123 456L 7R	7L 123 456R	do	do	do	123 456L 7R	1-7R	
V	12L 345 67R	34L 125 67R	56L 1234 7R	7L 1234 56R	56L 123 47R	34L 125 67R	12L 345 67R	1-7R
W	1-7L	67L 123 45R	5L 123 467R	34L 125 67R	5L 123 467R	67L 123 45R	1-7L	1-7R
X	17L 234 56R	26L 134 57R	35L 124 67R	4L 1235 67R	35L 124 67R	26L 134 57R	17L 234 56R	1-7R
Y	1L 2345 67R	2L 1345 67R	3L 1245 67R	456 7L 123R	3L 1245 67R	2L 1345 67R	1L 2345 67R	1-7R
Z	17L 234 56R	167L 234 5R	157L 234 6R	147L 235 6R	137L 245 6R	127L 345 6R	17L 234 56R	1-7R
1	1-7L	1-7R						
2	145 67L 23R	147L 235 6R	do	do	do	123 47L 56R	1-7R	
3	147L 235 6R	do	135 7L 246R	do	126 7L 345R	do	1-7R	
4	123 4L 567R	4L 1235 67R	do	1-7L	4L 1235 67R	do	1-7R	
5	7L 234 56R	do	123 47L 56R	147L 235 6R	do	145 67L 23R	1-7R	
6	1-7L	47L 123 56R	do	do	do	456 7L 123R	1-7R	
7	1L 2345 67R	do	do	do	do	1-7L	1-7R	
8	1-7L	147L 235 6R	do	do	do	1-7L	1-7R	
9	123 4L 567R	14L 235 67R	do	do	do	1-7L	1-7R	
0	234 56L 17R	17L 234 56R	do	do	do	234 56L 17R	1-7R	



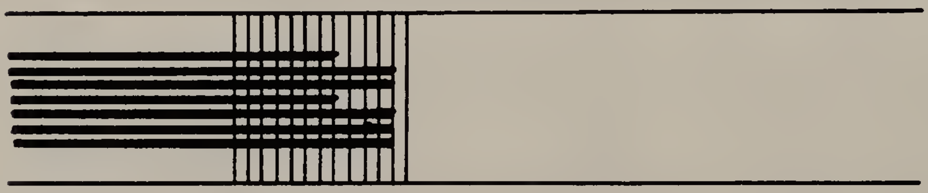
start



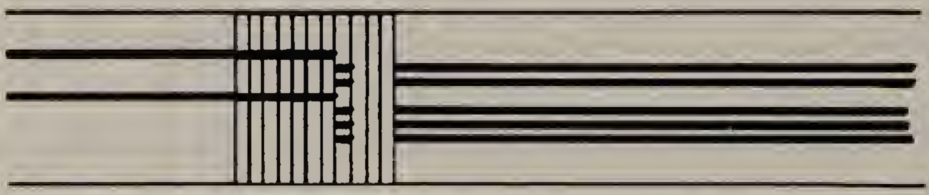
1 -7 to left



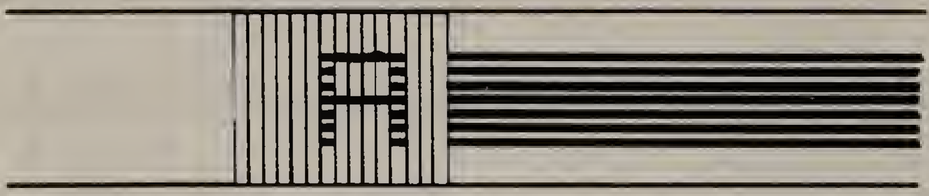
1 and 4 to left; 2, 3, 5, 6, and 7 to right



1 -7 to left



repeat for 3, 4, and 5



1 -7 to right

Weaving the letter A by following steps in the thread position table. Winding thread is shown outlined in white; weaving threads in black. First drawing shows band of weaving threads with one end wrapped over and ready to start.

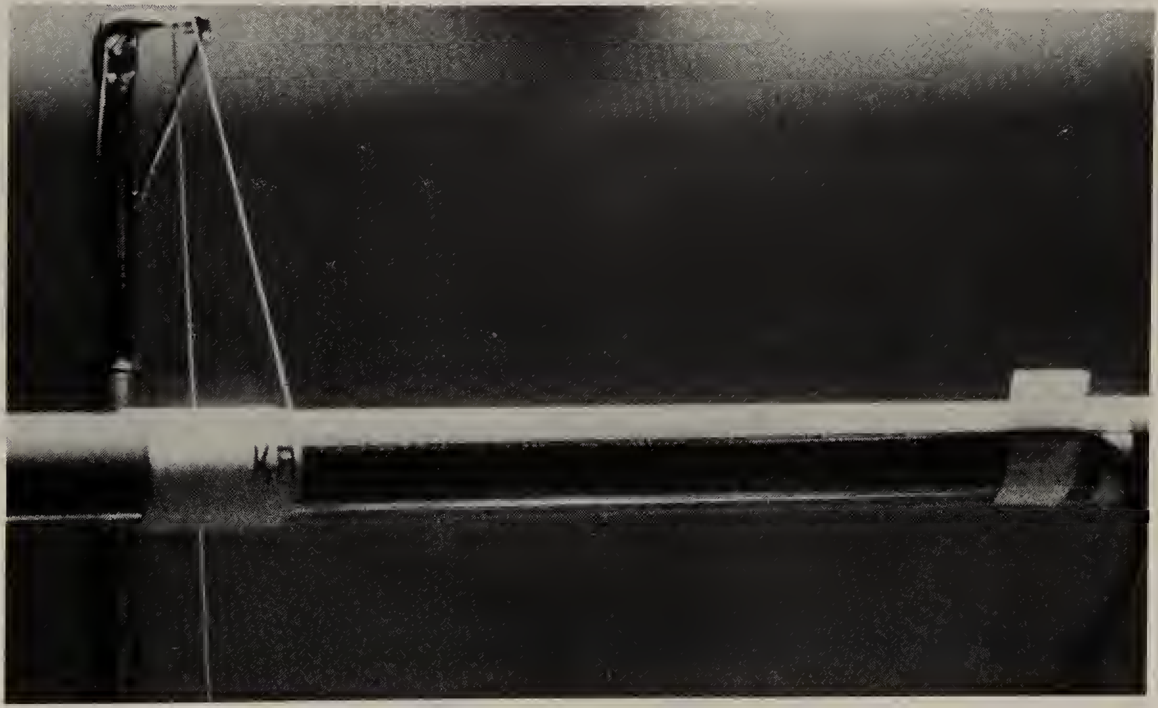
should keep the threads from twisting and should allow easy access to individual threads. The best I've come across was shared by RodCrafter B.D. Ehler at one of our Seminars. He uses two bands of double-stick tape (over top of regular masking tape) at each end of the blank. These are placed far enough to each side of the wrapping area to hold the weaving threads near their ends. The reason for two bands separated by a small space is to allow you to easily remove a single thread by picking it out of the space with a Thread Tool.

As you move threads back and forth in the weaving process, try not to touch the surface of the double-stick tape with your fingers or hands. Skin oils will destroy the adhesion, and the threads will no longer stick to the tape.

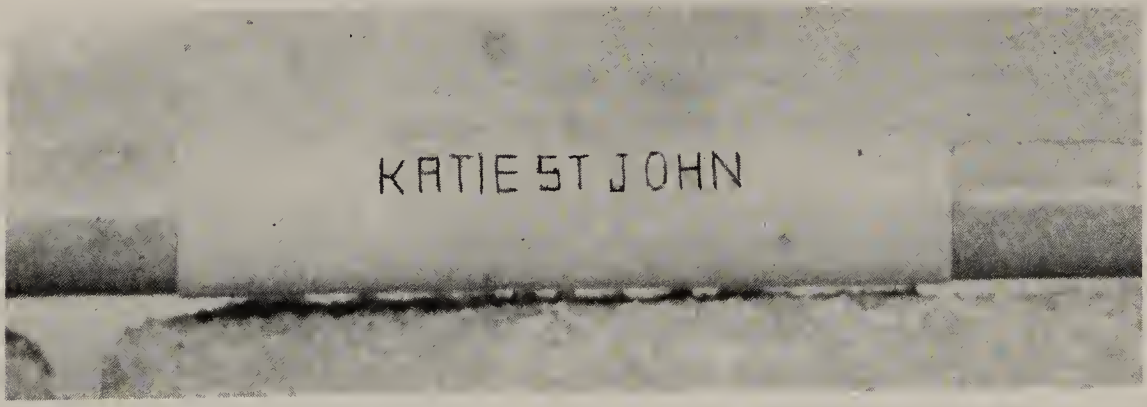
Pick up a thread with the Thread Tool. Move it to the other side with your hand but hold it by the very end. Lay it across the tape bands on that side (without touching the tape) and gently press it into the sticky surface with the Thread Tool. It works well if you just slide or roll the round part of the tool across the thread and sticky tape.

As each wind of wrapping thread is made, use your thumbnail to push the winds together and avoid small gaps. To count down the seven weaving threads to locate a certain one, the pointed end of a thread tool is very helpful. It can also be used to help loosen that thread from the band.

Alignment along the axis of the blank is critical to keeping all the letters in a straight line and of the same height. Check this alignment after each wind, and especially at the completion of each letter. Corrections can usually be made by moving threads # 1 and #7. If some of the threads went out of alignment before you noticed it, you can sometimes



First two letters completed on name being woven on Bill's rig.



Completed name woven in thread.

go back and move them with a Thread Tool or your thumbnail. As you move threads back and forth from side to side, try to keep them in position and not twisted.

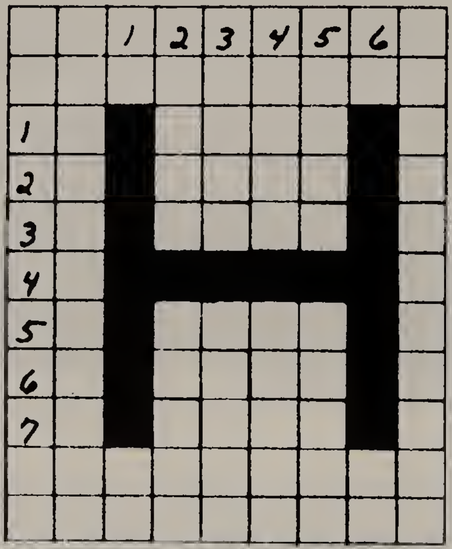
At the end of the name, wrap over the weaving threads for the same length as was wound over to start the wrap. Cut the weaving threads close to the wrap, and continue wrapping over them. Extend the wrap so that it is of equal length on each side of the name, and tie off in the normal manner.

I have tried to give rather detailed instructions so that you can more easily grasp the technique. After a little experience you will find that the process goes fairly rapidly, and that you can even eliminate some of the tapings.

Further weaving

This technique of weaving is not limited to making letters with thread. The rod builder who understands the process and who is venturesome and creative will see many other possibilities. Just as the basic diamond wrap was an open door to all varieties of cross wraps, so can writing a name in thread lead you to devise all kinds of weaves, such as silhouettes of fish and even entire scenes. All it takes is a basic understanding of the principles of weaving. To help you with that, we'll trace how the letter "H" was plotted for the table.

The place to start is on graph paper. Draw the letter "H" seven squares high and six squares long. Each square represents the thickness of one thread, so fill in the squares accordingly. Vertically, the squares represent the band of seven design threads, so number them 1 to 7 from top to bottom. Horizontally, the squares represent winds of the wrapping thread, so number them along the top from 1 to 6. Your graph paper should look like the drawing.



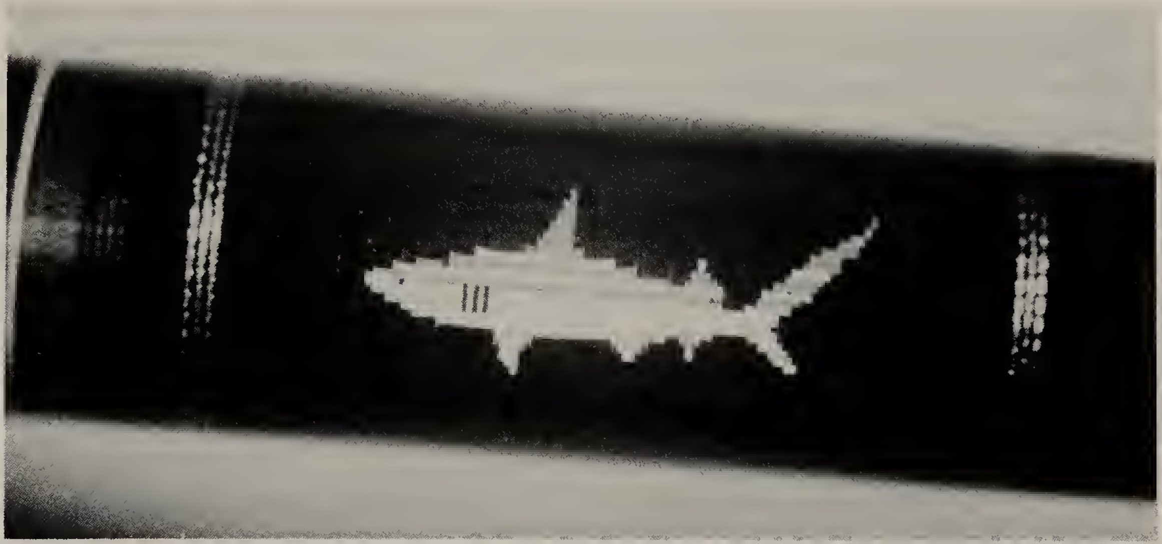
Graph paper is used to plot the steps in weaving a figure, in this case the letter H.

From the drawing we can construct a chart of steps to follow in weaving the "H". Any square that is filled in will have that numbered design thread to the left for that particular wind of the wrapping thread. (Left—on top—visible.) Any empty square will have that numbered design thread to the right for that particular wind of wrapping thread. (Right—underneath—hidden.)

The numbers across the top of our drawing are the winds of wrapping threads, or the steps. List them in a column from top to bottom. Opposite each of these steps we can list which threads will be to the left and which to the right.

	Left	*Right*
1	1-7	
2	4	1-3, 5-7
3	4	1-3, 5-7
4	4	1-3, 5-7
5	4	1-3, 5-7
6	1-7	
end		1-7

Using exactly those same principles, you can make any simple drawing over graph paper, then block out the squares to produce your drawing. Number the side and top of the graph paper and develop a step-by-step set of instructions, or what we call a "weave plot."



This weave of a shark was first drawn on graph paper and a step-by-step weave plot was developed.

Further thread artistry

By now it should be apparent that we have barely scratched the surface on the many, many possibilities for cross-wrap pattern designs and weaving techniques. After you've experimented with some of the thread ideas and methods and seen your creations preserved in wrapping finish on a rod, you'll know if thread artistry is something you would like to pursue further. To many rod builders, it is one of the most enjoyable and rewarding parts of the craft.

Since 1974, I have been in the enviable position of Editor of the *RodCrafters Journal* and anchorman for all our two-day regional and national Seminars held each year. As such, I've been a conduit for the sharing and exchanging of information on rod building and, of course, thread artistry. My book *Custom Rod Thread Art* is an in-depth exploration of the subject. It takes over where this book leaves off. Over 100 separate patterns, never before published, are pictured with step-by-step instructions. Equally important are 24 different design variations, almost *all* of which are applicable to *each* of the patterns.

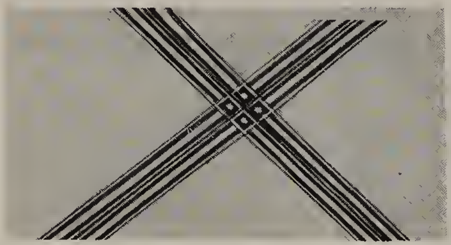
This, however, is much more than a book on patterns and design. It explains techniques for all kinds of thread work including weaving. If you would like more information, contact me at RodCrafters, 444 Schantz Spring Road, Allentown, PA 18104.

CREATING AND PLANNING WRAPS

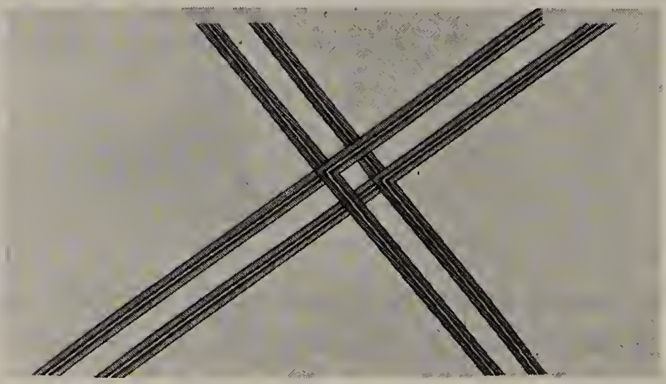
There have been many times when I wondered what a certain pattern would look like, but I did not want to make an entire wrap to find out. On other occasions I had an idea for a different technique, but needed to experiment with the sequence of threads. Then, of course, there were the times when I needed to see how specific color combinations looked. Fianlly, in desperation, I hit upon a method which allowed me to run all of these tests and experiments comparatively quickly. It may be of help to you also.

Take a piece of card stock such as lightweight poster board. I find a size of roughly 8 x 8 inches about right. Cover about two-thirds of the center portion with adjacent strips of double-stick tape or carpet tape. On this you can place threads in any combination and sequence to form an individual cross wrap pattern. Use lengths of thread longer than needed to span the tape. Press one end of the thread in place, pull any slack out of the thread, and press it in place. A Thread Tool will allow you to even shift the position of a thread slightly. It can also be used to push the length of the thread into the tape. If your idea needs to be adjusted, just grasp one end of a thread and peel it off.

If you are working out a specific technique or experimenting on a new wrap, keep notes of the construction steps. When an idea works out, plan on saving the card and wrap for future reference. In order to keep the card you will have to trim the ends of the threads and cover the exposed portions of sticky tape with pieces of regular masking tape. Place a border of masking tape around the edges to bind down the ends of the thread. You can transfer your notes to the back of the card so you can repeat the pattern at any time in the future.



Planning patterns on double-stick tape (four diamonds).



Experimental chevron pattern on double-stick tape.

COLOR COORDINATION

It has surprised me how often I have been asked about color combinations. Color is a very personal thing, and everyone has his own natural preferences. For that reason I always require a customer to select the colors used for all the components, and especially the wraps. Some people like bright colors, and lots of them, while others prefer only a few muted colors throughout.

Sometimes we have a tendency to place people in categories and assume we know what they like. I have been wrong enough times to now resist that temptation. For example, I erroneously assumed that an Orvis dealer for whom I built a graphite rod would want it to be quite plain with a minimum of threadwork. I therefore confined my discussion accordingly. He subsequently saw another customer's fly rod on which I had wrapped an intricate double diamond of conservative (in my opinion) colors. In short order I was confronted by him asking why I had not offered him the same thing. I replaced the butt wrap, and he liked it so much that he had me add similar threadwork to some of his Orvis rods. He now offers my custom wraps as an extra-cost option on the Orvis rods he sells. Granted, he does not have a great many takers, but there have been enough to convince me not to place people in categories.

Because of the very personal nature of color, I do not know just how much help I can provide the reader. Let me try, however, at least to suggest some guidelines. Just remember they are only one man's opinions! My first suggestion is to try for a unified color theme throughout the rod. This will, of necessity, start with the color of the blank. From there you make a decision to go with either the warm or cool family of colors.

Warm colors are often referred to as earth colors. They consist of browns, yellows, and reds. Naturally, there are many shades and mixtures of these colors. Cool colors are blues, greens, and silver. Warm and cool colors can be mixed, but one family should definitely predominate with the other used only as small accents. Black and white are neutral colors and can be used at will with either of the other two color families. They therefore are excellent choices when it is felt desirable to add another color as trim.

The two main areas of color besides that of the blank are the reel seat and the wraps. They should all be selected to complement each other and carry your color theme. Usually the rod will look best if all are from the same family of colors. Brown blanks, for example, look best in a color scheme of warm colors. A brown reel seat on a brown blank allows any combination of warm-colored wraps. If a gold reel seat is used, gold will look good as either the main wrap or as trim bands. A polished silver seat can, of course, also be used on a brown blank. It will, however, look best if the silver is repeated in the small trim bands. Here silver or white will serve as complementary accents.

Black blanks often look best with predominantly cool colors. Silver or black seats are better on these blanks than warm anodized colors. A black blank with silver or black seats can serve as the background for any color combination, but most people will find cool-color wraps more to their liking. White blanks are completely neutral and an excellent base for brightly decorated rods. This is one of the reasons they are preferred for off-shore trolling rods. If brightness is not your objective on a white blank, pick a main color from either the warm or cool family and use only small accents of one other color from the same family. Gold blanks are fairly neutral and can handle warm or cool colors. If cool colors are used, then a black reel seat blends nicely. I have found, however, that most people prefer a gold blank with warm-color wraps and a gold or brown reel seat.

Cork grips are neutral in color. Black resilient grips seem to look better with cool colors. They also provide a good background on a black or white blank for bright wraps. Very dark brown resilient grips work well with either warm or cool colors, but have an edge in the warm department.

Small trim pieces should either be used as accents to repeat part of the total color scheme, or be neutral. These would include winding checks, butt caps, and handle trim rings.

Rod builders often have trouble deciding on the colors to be used in decorative butt wraps. They naturally look best when the color of the guide wraps is the main color used. For the second color the trim-wrap color is a natural. If a small amount of a third color is needed, black or white will not upset the theme of the rod. Any other third color will have to be chosen carefully and used in the smallest possible quantity.

A good color scheme for some decorative butt wraps is one that contains the same color as that of the blank or the underwrap. Some very appealing and integrated wraps can be made using this principle. Personally, I have found that large expanses of white thread in either the butt wrap or the guide wraps stand out too much and detract from most rods.

Well, there are my thoughts—for what they are worth. As I said initially, they represent only one man's opinions, and color is a highly personal thing. Custom rod work is a creative endeavor, so that in the final analysis you should do your own thing.

EIGHT

Wrapping Finishes and Finishing Techniques

INSCRIPTIONS

After the wraps are completed the appropriate inscription should be placed on the rod. This is done before the wrapping finish is applied, since it will also be used to protect the inscription. A custom rod deserves the signature of the builder. It helps to set it apart as something special, and indicates pride of craftsmanship. If the rod is made for a customer or as a gift, that person's name should occupy the most prominent position.

The method I use is to place the customer's name along the axis of the rod which will be on top (0° axis) when it is fished. His name is made slightly larger than the other writing. On one side of the rod (270° axis) I write "Custom built for" in smaller script. On the other side of the rod (90° axis) appears "by Dale P. Clemens," also in the smaller script. Sometimes on the bottom of the rod (180° axis) I will place the fly-line weight, lure-weight range, or date. This, too, is done in smaller script. The entire inscription is placed next to the forward edge of the butt wrap. The exact wording is worked out with the customer beforehand.

There are a great many different methods that can be used for placing whatever inscription is desired on the rod. To cover all of them would simply require too much space, here. The *RodCrafters Journal* has had many articles and tips, shared by Associates, on unique techniques. Undoubtedly, future issues will present many more such methods. Here we will confine our discussion to the highlights of some of the more common ways of inscribing a rod.

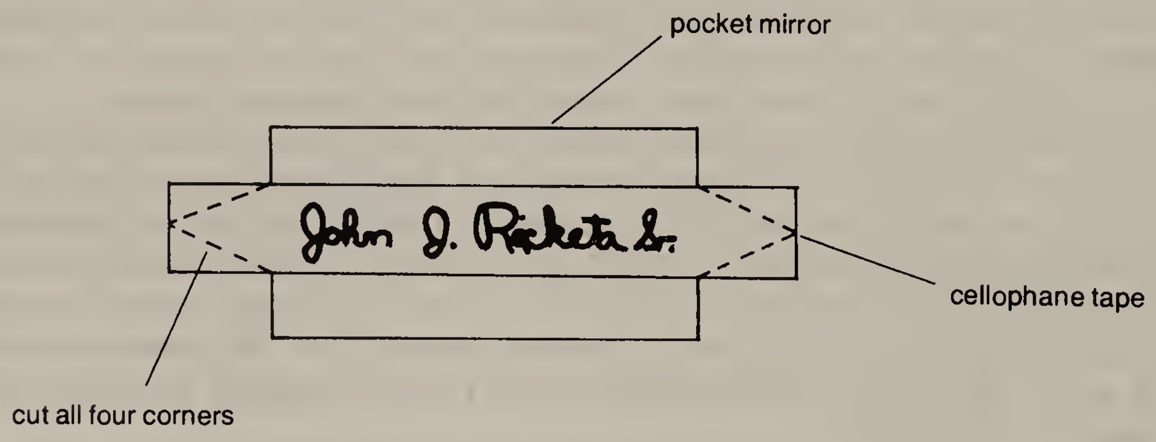
One of the easiest and, in my opinion, one of the most effective is to write directly on the blank. In order to provide a tooth for the ink, first dull the finish with fine steel wool. Use a tack rag to remove all traces of the steel wool. Follow by degreasing the blank with an acetone-moistened rag. Black india ink looks good on any light-colored blank. Drawing pens with interchangeable tips are inexpensive and work very well. Get a variety of tips for different line widths. A draftsman's reservoir-type pen, such as a Rapidograph by Koh-i-noor, is also great for black, but does not work well with light, opaque inks.

Dark-colored blanks require white or light-colored ink. Unfortunately, india ink and other drawing inks in these colors are semitransparent and do not yield acceptable results. You need a fluid that is completely opaque. Latex or acrylic paint can sometimes be thinned with water. If the proportions are correct, it will flow from the pen point and not be transparent. The best "ink" I have found for dark-colored blanks is Opaque White and Opaque Gold. They come in a small plastic bottle with a brush in the cap for easy application to a drawing-pen point. They are water-soluble for easy clean-up.

Some combinations of pen point and ink will start to flow easier than others. If you experience difficulty, try holding the point at different angles to start the flow. If the ink starts to dry on the point (and it does so fairly quickly), wipe the point with a water-moistened rag and apply fresh ink. If all else fails, switch to a different point. Once the ink flows, keep the pen moving.

Try to keep your writing in a line along the axis of the rod. Don't let it curve off to one side. I lay the rod flat on the workbench and pick up a highlight from the overhead light. Another method is to scribe a line along the axis with a ruler and dubbing needle. Still another approach is to place a piece of masking tape along the axis, but *below* the intended writing. This can serve as a reference line. If you make a mistake you can generally wipe it off with a damp rag, if you do it soon enough. If the ink has already dried, use steel wool and start over.

Despite many attempts, some people find it difficult to write on a curved surface. If you are one of these, use Scotch Magic Tape, as does RodCrafter John J. Racketa. Place a strip on a flat, smooth surface such as a piece of glass. Leave a tab overhanging the edge as a handle for peeling it off. Write on the tape with pen and ink, then transfer the tape to the rod. Smooth it carefully so no air bubbles exist, then apply wrapping finish over it.



Signature written on Scotch Magic Tape ready to be applied to rod.

One of the most impressive ways to inscribe a rod is to emboss it with rich metallic gold or other metallic colors. This is the same type of heat-embossing that has been used for years on quality hardcover books and certain leather items. The metallic colors come as sheets of thin foil, and an electric Heat Embossing Pen is used.

A piece of foil is cut a bit oversize and taped by the edges to the blank. The pen is plugged in and allowed to warm, then used to write on the tape. The precise temperature

Metallic gold initials and filigree on this reel-seat insert were made using a Heat Embossing Pen.

of the pen melts the coating on the foil and deposits it on the rod blank. Any mistakes can be wiped off immediately with lacquer thinner, but the embossing is permanent. For added protection, color sealant and finish can be applied.

If a person lacks confidence in his ability to write in a straight line on the curved blank surface, the system can be adapted so that it is foolproof. First, write the inscription on a piece of thin (tracing or tissue) paper as it lies on a flat surface. Make it exactly to the size you want on the rod. When it is written to your satisfaction, cut around it so that it is about the same size as the piece of metallic foil already taped to the blank. Tape the inscription over the foil. Now simply follow your lines on the thin paper with the pen and they'll be transferred in metallic color to the blank.

Incidentally, this same Heat Embossing Pen is used by many rod builders to inscribe wood reel-seat inserts, particularly in gold. RodCrafters Jim Richardson and Jerry and Joyce Benyo also decorate their wood seat inserts by the same technique. Their designs run from the simple line drawing of a fish to beautiful filigree—all done first on thin paper, then transferred.

Some rod builders prefer printed letters to handwriting. These can be placed on a rod by using one of the many kinds of press type available from graphic-arts dealers. The sheet containing the letter is placed over the rod and burnished to transfer it. If you have trouble working with the large sheets, cut out the individual letter and place it on the underside of a piece of Scotch Tape. Put the tape in position on the rod and burnish the tape and the paper. When the letters are transferred to the rod, peel the tape away.

Custom-printed small strips of paper or mylar can also be used. These are glued to the rod with epoxy and any bubbles carefully smoothed away. They, as well as any form of inscription, can be wrapped over with Size 00 or A regular white thread. No color preserver is used on the thread so that the thin wrapping finish used makes it transparent. On light-colored blanks the thread will be clear. On darker blanks it will have a slight gray color.

THE FINISHING PROCESS

A topnotch wrapping finish must do a lot of things, but above all it must look good, both when it's applied and years later. On that, every rod builder agrees. Another point on which you'll get agreement is that most everyone has some kind of problem at one time or another with his finish. Some of us are looking for a magical solution or a new miracle finish. Neither is really needed. We have good chemical compounds to meet our requirements. We just need to select properly and then employ good, sound application techniques. When we do, 95% of our problems will disappear.

Too often, rod makers start to think about finishing when they are mixing the resin and the catalyst, or even a little later when they are brushing it on. Finishing really starts with your thread. Oftentimes the spots or blotches that appear when the finish dries are traceable to thread contamination of one kind or another. Eliminate dirt on the blank by always wiping it with alcohol before doing any wrapping.

Thread should be stored in covered containers. Airborne dust, dirt, and atomized oils (from machinery or electric motors) may settle on thread. You won't see it, but it will show after the finish is applied. For this reason many rod builders always strip off the top layer of thread from the spool before using it. You never know how and where it was stored before it got to you. The covered containers should be light-tight as well, since NCP thread will deteriorate from exposure to fluorescent light and sunlight until finished.

How you handle thread in wrapping can be another mysterious cause of problems. Everyone's body chemistry is slightly different, but microscopic amounts of skin oils can be damning. All of us must wash our hands thoroughly before wrapping, and again later if it's a long session. Those who suspect that perspiration or skin oils have ever spoiled a wrap, or may ruin one in the future, should use rubbing alcohol and paper towels before, and periodically during a wrapping session. With some people, the problem is so acute that they wear white cotton gloves.

If these examples of thread contamination seem exaggerated, be assured they are not. If you looked at nylon and especially NCP wrapping thread under a microscope, you would find it is quite porous, and, like a sponge, retains anything it contacts.

A very serious offender, to which we will refer again, is silicone. Here, I am thinking of it as an ingredient in hand cream, or even after-shave lotion. It is difficult to wash off, migrates easily to other surfaces (thread and wrapping tools), and will ruin a wrap. Sometimes it shows as tiny darker-colored spots in the finished thread. At other times a "fish eye" or crater or small area forms where the finish literally pulls back from the thread. You can brush over it and a few minutes later it has drawn back again. Some oils will produce the same reaction, but silicone is the worst offender. Remember it. We'll be talking about it more as we go along. It is one of the biggest causes of finishing problems and can come from the least suspected place. To make detection worse, it might show up as a problem only once out of every hundred times. But if it ruins a butt wrap that took many hours of work, it's a disaster. If you develop good techniques and habits, the chances are good that it will never bite you.

Color sealant

Many people think a color sealant or color preserver has only one function, to retain the original color of the nylon thread. That is certainly expected, but there are other very important jobs the color sealant must perform. One of the most important is to displace air trapped in the windings. This consists of air between the individual threads, and especially the air inside the thread itself.

As mentioned, nylon thread is very porous. NCP is even more so, definitely sponge-like. There is often a mistaken belief that NCP is regular nylon that has been pretreated with color sealant. Actually it is an entirely different textile that is opaque. It is this opacity that prevents it from becoming semitranslucent when finish is applied. It has some other properties that differ from regular nylon. For one, it lacks the sparkle and specular highlights of regular thread. It is also about 15% weaker and about 20% larger in diameter per designated size. This relationship is largely due to the very spongy consistency of NCP, and that is our concern for finishing.

Unless we displace the air in the thread before the finish is applied, some air will be released into the finish. Given enough time, the air might float to the top and break free of the surface tension. Finishes, however, set up in a matter of hours and the air is trapped inside in the form of bubbles. Some of these bubbles are large and easily visible. Others are exceptionally tiny and percieved as a haze or lack of clarity in parts of the finish. In either case they are obviously undesirable.

All thread—regular and NCP—must have the air displaced with sealant. It would be less confusing if NCP thread were named opaque thread. If you have any doubt about the need for sealant on NCP thread, wrap a one-inch band of regular and NCP next to each other on a piece of scrap blank, then apply a 50/50 thinned water-based sealant to both. As you do you, will see that the NCP soaks up quite a bit more sealant and releases a lot more air (in the form of bubbles).

It is axiomatic that if an important function of color sealant is to displace the air in and around the thread, the sealant must be as thin as possible. It is recommended that you thin or dilute the first two coats of whatever color sealant you use. Just be sure you are using the proper thinner. With Brilliance, use water.

Another job the color sealant is expected to do is to penetrate the thread completely and cement it to the blank. If the sealant acts instead as a coating for the thread, it preserves the color by creating a barrier to the finish. Only a very tiny amount of finish would touch both blank and wrap, and guides would be poorly anchored to the blank. The sealant should provide a resilient bond of thread to blank and also chemically bond with the finish.

This is especially important in heavy-duty saltwater rods. For some reason, NCP thread has been more popular among saltwater rod builders than it has with freshwater rod makers. Years ago, RodCrafter Pete Marken did some testing and developed a system that is today widely used by knowledgeable saltwater rod builders. When he used NCP thread he applied two coats of Crystal Coat wrapping finish, thinned slightly with Epoxy Thinner, *as an initial sealant.* Crystal Coat is a thin epoxy wrapping finish, and when thinned a bit more it displaced the air trapped in the windings (as would a color sealant). It therefore provided an excellent base for another finish. Since Crystal Coat is a strong two-part epoxy, it bonded the threads completely to the blank in the strongest possible way. After allowing a few days for the Crystal Coat to cure, he applied a high-build finish.

When we learned about what Pete and others were doing we ran quite a few tests. We tested both Pete's system with NCP thread and guides wrapped with regular thread, then sealed with Brilliance, followed by Crystal Coat and a high-build finish. We found that all guides, especially high-frame roller guides, were held in place on the blank much better than with any other system, including double and triple wraps. The increase in strength over high-build polymer finishes applied directly to NCP was very significant. The high-builds did not penetrate and displace the air as did the thinned Crystal Coat. Strength was comparable with regular thread when first sealed with Brilliance, then further cemented with the Crystal Coat and topped with a high-build. Again this was stronger than the same thing without the Crystal Coat step between the sealant and the top finish.

This is an extra step and therefore takes a bit longer. However, if the custom rod builder wants to produce the finest rod possible, he'll opt for the extra step. One word of caution. You can put high-build finishes such as Flex Coat and Poly Build over Crystal Coat if you allow a few days for the Crystal Coat to cure, but you *cannot* place Crystal Coat over the Flex Coat or Poly Build.

Let's get back to the numerous functions of the color sealant. In addition to those things already discussed, it must remain water-clear and not yellow. It also must remain resilient and not become brittle. For many years, clear nitrocellulose lacquer has been sold by quite a few companies as Color Preserver. It fails badly at both of these jobs. The longer it is on the wrap and the more the rod is exposed to sunlight, the more yellow this color preserver becomes. I sometimes show a rod at seminars that has green thread on top and bluish green thread on the underside. Actually, the thread was originally light blue and the color cast comes from the lacquer color preserver turned yellow. Jim Richardson also has shown a sickly greenish rod that was originally wrapped with light gray thread. I've seen many rods where the NCP white trim bands have turned ivory, then yellow from lacquer. Enough said!

Lacquer-based color preservers also become quite brittle with age. This is not the only cause but it is a significant contributor to the cracking and checking of the finish around the ends of the guide feet. Fine hairline cracks that are seemingly imbedded in a rod's finish are also often caused by lacquer-based color preserver. If I accomplish nothing else in this chapter, I hope I am successful at motivating you to switch from lacquer to one of the newer water-based color sealants.

Selecting the proper color sealant will do much to improve the finish of your wraps. Applying it properly will do even more. Develop the habit, for example, of using a brush only for one chemical, and labeling it for such. You don't need an expensive artist's brush for sealant or finish. On the other hand, don't use the cheap tynex bristle throw-away or discardable brushes. You need a natural-bristle brush that has a flat shape. If you use a brush for only one purpose and clean it properly in the right solvent, it will last for a long time and you won't contaminate one finish with another.

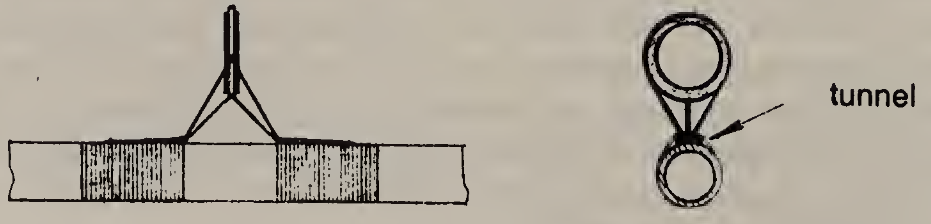
Where you apply your color sealant and finish is as important as how. You very definitely need a dust-free area and dust-free atmosphere. This is more critical for the finish, but you can mess up a rod with dust and lint embedded in the sealant, too.

Use a tack rag immediately before each coat of sealant and finish. *Do not wipe* with a tack rag. It contains all kinds of sticky resins which you do not want to transfer to your thread or blank. The tack rag is designed to pick up and hold particles of dust and lint. To use it, fold it into about a four-by-five inch format. Hold it so that just a corner of this pad rests by its own weight on the wrap. With the other hand rotate the blank. That's it—no wiping. Store the tack rag in a capped widemouth jar such as a peanut-butter jar.

As suggested earlier, thin the first couple of coats of color sealant for maximum penetration. With Brilliance, mix approximately equal parts of water and Brilliance and stir. The third coat (and a fourth if you want) is applied full-strength. With other brands of sealant, follow the manufacturer's instructions.

With water-based sealants apply a very full coat to the thread. Hold a saturated brush against the wrap and rotate the rod. On the first couple of coats, keep applying sealant to the wrap until the thread will not absorb any more.

There is a "tunnel" alongside of every guide foot. It is a hollow space formed when the thread bridges from the top of the guide foot to the blank. This tunnel must be filled



side view

sectional view

Color sealant must fill tunnel along guide feet.

with color sealant so that the thread is saturated throughout. The best way to do this is to apply the sealant from the outside edge of the wrap toward the guide ring. First, do one side of a two-footed guide, then repeat—outer edge to guide ring—for the other side. By applying the sealant in this fashion, the air is forced out of the tunnel's mouth and not trapped inside. When the wrap has been completely saturated, poke the bristles of the wet brush into the mouth of the tunnel. By the second, and especially the third coat, you want to get enough sealant across the mouth of the tunnel to seal it closed. This will prevent finish from entering the tunnel when it is applied later. You will be able to close the tunnel on all except the largest and thickest guide feet. On these, get as much color sealant inside the larger tunnel mouth as you can, thereby effectively sealing the thread on the inside.

If you have a low r.p.m. rod dryer, use it for application and to keep the rod turning slowly while the sealant dries. You can also turn the rod 180° about every five minutes during the first 15 minutes. To hold the rod in position, place a piece of masking tape across the blank and the rod supports. Another approach used by some is to apply sealant until each wrap will absorb no more. Then, after all wraps are complete, dry the brush on the edge of the bottle and go back to the first wrap you did. Use the dry brush to lift off any unabsorbed sealant as you rotate the rod. Do each wrap in turn and you will not have to be concerned about rotating the rod while the sealant dries.

My own experience with Brilliance is that I can saturate threads and just let the rod sit. The excess will flow to the lower side of the rod, so I tape the blank with the guides on the lower side. The slight build-up of dried excess sealant is never noticeable after the finish is applied. Let me share another bit of information on Brilliance. We build a lot of test blanks into rods for field testing by myself and others, and time is critical. On most we use no finish, just multiple coats of Brilliance. I have fished some of those rods hard (in sun and rain) for as long as two years with never a problem with the wraps. Obviously, they do not look as good as they would with finish, but the Brilliance in and of itself wears like iron and stays flexible. Any finish put on top need only be a thin layer. Any more than that and you are simply adding needless weight.

With water-based color sealants, you can apply the next coat in about 45 minutes to an hour if the humidity is low or average. When (or where) the humidity is high it will require longer between coats, from a few hours to overnight. In any case, after the last coat of sealant it is always best to wait overnight before applying the first coat of finish.

The finish

Rarely does anyone use varnish today on new rods. Practically all finishes are two-part mixtures of resin and catalyst. These can be roughly divided into two types. *High-build finishes*, sometimes referred to as polymers, are thick, viscous, and heavy. These syrupy mixtures are almost always of 100% solids. *Regular finishes*, which some people call thin finishes, have a solvent in addition to the resin and catalyst. They are less viscous, more free-flowing, and not as heavy. They can be applied in thinner, more controlled layers when desired. Both finishes cure or harden by catalytic action. In the regular, or thin, finish, there is also evaporative action as the volatile solvent leaves the mixture.

Just as there are a number of functions that a good color sealant must perform, so are there different jobs that the finish should accomplish. Obviously it should look good, not just after it is applied but a number of years later. Some finishes will oxidize on the surface and lose a percentage of their gloss. By far a more frequent problem is ambering or yellowing.

Earlier we found that lacquer-based color preservers will turn yellow beneath any finish and should be avoided. Finishes themselves will sometimes amber from the ultraviolet sunlight or simply from age. This is more likely to happen with the high-build finishes. The problem is compounded by the very nature of the high-build material in that there is a considerably thicker layer of yellowish finish to look through.

A good place to see this ambering effect is on a white off-shore trolling blank that has been in use just one or two seasons. Look at the tiny bands of finish that project beyond the ends of the thread wraps and cover only the white blank. This fact alone has led a lot of rod makers to build their saltwater rods on black blanks. The saltwater rod, with its underwraps and size D guide wraps on large-diameter blanks, is the logical place for a high-build finish. However, if the finish will turn yellow with age, don't build on a white blank, or don't use that finish.

Some finishes look perfectly clear in the bottle and some have a slight color cast. It's not so much a matter of what they look like in liquid form but what they'll be like a few years after they are applied. Crystal Coat, a thin finish, is a good example. It has a slight cast initially but if used over Brilliance, it will never become yellow or darken. Since it is thin, the inherent slight color is less noticeable.

A quality finish must have good adhesion properties. If it does not, it will separate from the thread and/or the blank and in time may peel or allow water to get to the thread. The finish also needs to be abrasion-resistant both for continued good appearance and for protection of the wraps. Just as the color sealant needs to have a certain resiliency and flexibility, so does the finish. The guide flexes but the guide foot does not, and the finish is exposed to stress every time the rod bends. If the finish becomes brittle, it will crack and check.

A good finish should be light in weight if it is going to be used on freshwater rods. It also should be capable of spreading thinly on a wrap so that it does not add unnecessary weight because of uncontrollable volume. Two finishes might weigh the same, but if one can be applied only in a thick coating it will add extra weight. This can be a problem on a light tip section where there are more guides and the blank is more flexible. A heavy finish, or one heavily applied, can slow the action of the rod. If you remember our discussions about sensitivity and the stiffness-to-weight ratio, that extra weight from the finish can lessen the sensitivity of the ultralight and light graphite rods.

Some rod builders evidently ignore the unnecessary weight and/or thickness of a finish when they use high-build finishes on light rods. Factory-produced rods quite often employ these finishes because application is fast—one coat and they're done. I like to think that custom rod builders are more concerned with producing a better fishing instrument. Perhaps those that pair the light rod with the thick, heavy finish simply are not aware of the problem.

At different times over the years, I have actually weighed finishes. I carefully calculated the areas on the rod that were covered with finish. These were then duplicated on two identical pieces of aluminum foil which were weighed, then each coated with the respective finishes. The finishes were allowed to cure about a week and then each was weighed. In the first edition of this book I reported on a weight of 31.8 grains for the thin finish (Crystal Coat) and 115.5 grains for the high-build finish (Envirotex.) What I emphasized then was the ratio of 3.6 to 1—that the high-build was about 3½ times as heavy. Over the years, whenever I've done this test with different finishes, *the high-builds have always weighed at least three times as much.*

For me, at least, the route is clear. All ultralight rods, all fly rods, and most light freshwater rods should be wrapped with size "A" or "OO" thread and finished with ony enough thin finish to level the threads. A fingernail moved across the finished wrap should not be able to detect any thread ridges. Any finish beyond that is only adding unneccessary and undesirable weight to the rod. The thick, bulky appearance given the guide wraps is also out of proportion to the slim blank and deemed unattractive by many.

This is not to say that high-build polymer finishes have no use. Saltwater rods, heavy-duty freshwater rods, and any rod wrapped with size "D" thread will look best with a high-build finish. Also, if you like a decorative butt wrap to appear as if it is encased in a glass-like sheath, you will find it easiest to use the high-build finish just on the butt wrap. When you get into a borderline situation and question if the extra weight on the butt wrap may be desirable, remember that it is quite close to the fulcrum and will therefore have very little effect on balance. Also, the extra weight is not on the tip where it might slow the action of the blank. The butt-wrap area does not flex much and there are no guide feet to cause checking and cracking.

Each of the two types of finish has its place. Learn where to use them and, very importantly, how to use and apply them.

Regardless of the finish, the room in which you apply it is very important. If possible, use a room where there is generally little traffic and where it is comparatively easy to keep dust under control. If you have only one room, don't sand cork and then a couple of hours later apply finish. You'll need to knock down dust in the air with a fine mist from a spray bottle of water before and after you vacuum. Allow the air to settle overnight before finishing in the room. Again, spray a fine mist of water in the air just in the area in which you'll be working. Plan your finishing so that you will be moving around as little as possible to keep from stirring up dust.

If your finishing work area has an unpainted cement floor, it must be vacuumed periodically to remove the fine powdery residue that forms on the cement. Or coat the floor with concrete floor paint or sealer. Don't apply finish in the basement when there is traffic on the floor above. Wait until family activity on the first floor has subsided for the night. If you don't, fine dust will filter down.

A great deal of dust or fine lint is carried on your clothing, especially in the winter, and is readily transferred to a rod being finished. If you can get hold of a long nylon lab coat, wear it. If not, try a thin nylon windbreaker. You'll be amazed at the difference it makes. In winter or when the humidity is very low, give the front of your clothing three or four shots of fine water mist to down the lint and dust. Store mixing containers, implements, and brushes in dust-free containers.

If dust continues to be a problem, consider installing a filtering system of one type or another. In my finishing room I have a Sears electrostatic air cleaner. I turn it on high about 30 to 60 minutes before I want to work. When I enter the room, there is no dust. Various RodCrafters have made their own filtering systems in a box with a blower. These are turned on hours before they plan on finishing. They are turned off while applying the finish so as not to circulate air over the rod.

As you can see by my emphasis on dust, it is a major potential problem. Do everything you possibly can to control it. A few years ago a RodCrafter showed me a rod on which he had meticulously woven a number of complete scenes in size "A" thread. Some were on one side of the rod and some on the other. This meant simultaneous weaving, or keeping track of two weaves, each separated by only half a revolution of the rod. He had untold numbers of hours invested and the weaves were absolutely fantastic. I was jolted, however, when I looked at it. The finish was full of tiny specks of dust and lint. Here was some of the finest weaving I had ever seen, practically ruined by a poor finish. It was like looking at the Mona Lisa over which someone had placed a dirty, bug-strewn windshield.

High humidity can cause problems with any finish. Generally it will take much longer for the finish to cure. It may stay tacky for days, even weeks, if the humidity remains high. If it is warm, bring the rod into an air-conditioned area where the humidity will be lower. If it is cool and humid, try raising the ambient temperature. I've done this a number of times using one or two photoflood bulbs in reflectors or using a long floor-type electric heater. You don't want to get either of these heat sources very close to the rod. A few feet away is close enough to raise the surrounding temperature. In no event do you want to heat the rod more than to 100° F.

Earlier I suggested using a fine water mist from a spray bottle to help knock down airborne dust. Similarly, a couple of squirts to the front of a nylon windbreaker will help hold lint and dust. In these situations you obviously would use the water mist sparingly and keep it very localized so as not to raise the humidity significantly in the finishing room.

An excellent solution to the dust and humidity problem was originally shared by RodCrafter Jim Corbin and has since been adopted by many rod builders. In Jim's article in the *RodCrafters Journal*, the descriptive title "Corbin's Covered Cooker" was used. Subsequent variations and adaptations by other rod builders have been called drying boxes, rod caskets, and dust-free containers. All of these give you a pretty good idea of what's involved.

In the chapter on tools there is a more complete description of a dust-free drying box. Basically, we're talking about a long, shallow box with a hinged lid into which the longest rod or rod section that we might make will fit. A low-r.p.m. motor is attached to turn the rod while the finish cures. It's helpful if the actual finishing can be comfortably done with the rod in the box. Then the lid is merely closed. Mild heat can be provided from some low-wattage light bulbs or a heat tape strip. This will serve to drive out humidity and help accelerate the curing process.

Mixing and application

Mixing the two parts of any finish is critical. The requirements for just about all finishes are that you mix equal parts of resin and catalyst, the familiar parts A and B. The two parts must be as nearly equal in volume as you can measure. If not, the mixture may not set up properly or may be lacking in desirable qualities.

Instead of delving into some of the more intricate techniques for measuring, let's pause and look at the problem logically. The smaller the quantity of finish we try to measure, the greater will be any error. If someone is off one inch in a yard, the error is a lot less than if off one inch in a foot. Similarly, in measuring finish if we are off a drop in two tablespoonsful it has less of an effect than if we are off a drop in two cc's. So, regardless of the method you use, *don't try to mix minimal amounts of finish*. It's false economy. You will spend too much time trying to be super-accurate with tiny amounts and/or you'll get a bad mix of finish sooner or later which will ruin some of your thread work. Instead, mix about twice the amount of finish you'll need.

Parenthetically, we might add that if you are working with a thin finish like Crystal Coat you have a pot life of quite a few hours. This lets you mix enough for two coats at once, reducing the chance for error.

Since we have raised the subject of thin finishes, let's deal first with the specifics of mixing them. They present by far the least difficulty. The one thing that must always be kept in mind is that Crystal Coat and other thin finishes contain a strong solvent. The solvent may possibly react with any plastic implements, actually absorbing a small amount of the plastic into the finish. The drying cure is adversely affected and the finish may never set up properly. It could just stay tacky.

There are many different types of plastic and only a few will be affected by the solvent. There is no way of knowing, however, if an item is always made of exactly the same plastic, time after time. You may have used it before with no problems but now for any one of a dozen reasons it reacts with the solvent and your thread work is ruined. The best course to follow is not to use *anything* made of plastic for a measuring device, mixing container, stirrer, or palette. (This means no margarine or coffee-container lids unless you cover them with a piece of aluminum foil.) Obviously, don't use plastic measuring syringes. It's also best not to use cheap throw-away brushes because the bristles are made of plastic instead of natural hair. The brush handles on some are also of plastic.

We have recognized this for years and have recommended and carried wood stirrers (Mix-Sticks), aluminum-foil mixing containers (Mix-Alls) and the most foolproof of all measuring devices, stainless-steel measuring spoons.

To use a metal measuring spoon, hold it horizontal at about eye level and carefully pour one part (catalyst or resin) into the spoon bowl. Stop when the liquid is level with the top. Pour the liquid out of the spoon into an aluminum-foil or glass mixing cotainer. Use a wood Mix-All or craft stick to scrape all of the liquid out of the spoon.

If you have only one set of spoons, clean the spoon by wiping it with a paper towel moistened with solvent such as alcohol. It's more handy to have two sets of spoons with one labeled "A" and the other labeled "B." Repeat the pouring procedure with the remaining part. The viscosity will be slightly different between "A" and "B" (resin and catalyst) so you'll have to be careful to get exactly the same amount of liquid in the bowl of the measuring spoon—nothing difficult, just requires care. The trick, if there is any, is to scrape all of the thicker, more viscous liquid from the spoon into the mixing container.

After you have done this once or twice you will be amazed at how accurate your measuring will be. We ran some elaborate tests using both thin and high-build finishes to see how different measuring tools and techniques compared. Our conclusion was that metal measuring spoons used in the manner just described will do as well as or better than any other practical method available to the custom rod builder.

With both parts of the thin finish in the nonplastic mixing container, use the wooden craft stick (Popsicle stick) to thoroughly stir the mixture for about two minutes. Let the mixture stand at room temperature for at least half an hour before applying to the wraps. No special techniques need be employed when mixing because the thin finish will not retain air in the form of bubbles. The same is true of applying it to the wraps. There will be no bubbles in the finish and if any are induced by the brush, they are easily brushed out or will float to the surface and break.

While Crystal Coat is definitely in the regular or thin category, it can be thinned a bit more to about the viscosity of warmed varnish. This gives it incredible flow characteristics and it levels beautifully to a smooth, glossy finish. For this, use Crystal Flo, an exceptionally high-grade thinner. First, mix one part "A" and one part "B" per the technique outlined above. Allow the well-stirred mixture to stand at room temperature for one hour. Add 1/8 part to 1/4 part of the Crystal Flo, stir, and apply to the wraps.

Whether used in the standard mixture or thinned, apply to the wrap with a natural-bristle brush. Load the brush and hold it against the wrap while rotating the blank. Allow the finish to extend about 1/16 inch to 1/8 inch past the end of the thread wrap and onto the blank. The edge should be a straight line around the blank. Make sure the entire wrap is covered and that the mouth of the tunnel alongside the guide foot is sealed off with finish.

The inscription above the decorative butt wrap or hookkeeper wrap should be covered with an extension of the finish from the thread. Brush the first coat along the axis of the rod to thin the coating progressively toward the tip. Make sure you cover not only the inscription but any of the blank's finish that had been dulled by steel wool. Try to feather the upper edge of the finish into the original factory-applied blank finish. If you use a second coat over the inscription, repeat the procedure but feather the coat at a point not as far up on the blank. This feathering is easy to do with Crystal Coat, even easier if it's been thinned slightly. By comparison, it is quite difficult to feather the high-build finishes. When using them it is better to place a narrow band of thread at the tip end of the inscription and terminate the finish there.

After the finish is applied, move around as little as possible in the immediate area to keep from stirring up dust and lint. You do not want to do anything that will cause a flow of air or a draft over the rod. It is best to clean brush and mixing utensils in another room or as far away from the rod as possible. When I used to work in my basement, I even tiptoed up the steps next to my workbench and carefully closed the door.

The time between the first and second coats, if desired, can be as little as 35 to 40 minutes with the thin finishes such as Crystal Coat, provided you use a very full brush. The first coat will not be dry, but a second wet coat can be flowed on. Don't let the brush get empty of finish so that it drags on the first coat. Instead, work with a well loaded brush. If a third coat is desired, allow the first two to cure overnight before applying it. One of the advantages of the thin finish is that it can be kept minimal on the tip and thicker (more coats) on the butt.

If more than 48 to 72 hours elapses between coats of epoxy, the finish (in the case of Crystal Coat) will have cured to the point where another coat will not adhere as well as it should. In that case, lightly break the surface of the finish with Smooth Scuff or fine steel wool before applying another coat.

High-build difficulties

Earlier it was mentioned that most rod builders have had problems at one time or another with their finishing. Over 90% of those problems were experienced when working with the high-build finishes. They are just that much more difficult to use.

High-build finishes became popular, initially, as a way of very quickly getting a thick, heavy finish over thread, especially decorative butt wraps. In most cases, only one very heavy application was necessary if the rod was turned on a low-r.p.m. dryer. In fact, if the rod was turning while the finish was applied, a super-heavy coat could be applied and it would not run off the butt wrap.

These thick, syrupy finishes are made entirely of solids and do not have any evaporative solvents. Their heavy viscosity is what enables them to form thick, high-build coatings. It is also why these finishes have bubbles. When the two parts of the finish are combined and stirred together to blend them, air (in the form of bubbles) is inevitably trapped in the thick mixture. The finish, as it is mixed, is so viscous that it is extremely difficult for the air to escape. The bubbles may be large enough to be easily identified or they may be so tiny as to appear as a haze in the cured finish. Whatever their size, bubbles are the primary problem with high-build finishes. All the techniques developed by rod builders for working with high-build finishes are aimed at trying to solve the bubble problem.

Interestingly, most things that have been written about the application of clear (non-pigmented) finishes for non-rod building purposes, such as finishing wood, metal, etc., emphasize that numerous coats of a thin finish are always superior to a single thick coat. I think that in our zeal to get a quick, one-coat, high-build finish we may have made a basic mistake. It does produce bubbles for which we keep trying to devise remedies.

I personally feel the best approach to the problem is to thin the high-build finish slightly so it will not retain the air in the first place. The previously mentioned Crystal Flo or regular acetone will work very well. By adding a small amount of thinner to just one of the two parts (either resin or catalyst) and stirring, it becomes less viscous (or thinner and more runny). Then when the other part of the finish is added and stirred, the mixture has already been thinned and air is not so easily trapped.

The amount of thinner added should be small, no more than one fifth (20%) of the total mixture. In most cases, less thinner will achieve the desired result. Our example will help show amounts as well as the mixing procedure. First measure 3 cc of part A. To this add 1 cc of thinner. Stir and blend the thinner and part A for about a minute. Measure 3 cc of part B and add to the previous mixture. Again stir and blend the mixture. This time for about one and a half to two minutes.

In the example, the thinner was one seventh (14%) of the total mixture. This a high enough percentage to prevent air from becoming trapped. Since the solvent thinner is quite volatile, a small amount evaporates during stirring, and the balance when the finish is spread out on the thread. The thinned finish does produce a thinner coating on the wrap, but there will not be any bubbles.

By thinning the high-build finish in the proportions suggested, you will still need only one coat or two at the most on most guide wraps. The exceptions might be very large blanks and guides that have been underwrapped. Butt wraps will require two coats if you like a heavy coating.

Some other techniques you may want to use if you do not add thinner—or even if you do—will help fight the bubble problem. First of all, don't stir the mixture in a manner that introduces air. RodCrafter Carl Waxman mixes the two parts on a flat laboratory mixing pad. A piece of clean glass or a square ceramic tile can also be used. Most importantly, Carl uses a small laboratory-type mixing spatula. Instead of stirring, the two parts are folded into each other. RodCrafter Randy Ruwe uses a small, straight-sided mixing cup and a wooden craft stick. He holds the stick against the bottom and side of the cup with his right hand. The stick is not moved. Instead the cup is rotated in his left hand, causing the mixture to flow against and around the stick, blending itself without introducing any air.

An excellent way to remove any air trapped in high-build finish is with a vacuum pump and small vacuum chamber. This was first demonstrated by RodCrafter Jim Nagao at one of our California seminars and then by Don Dewey at a National Seminar. This may not be feasible for many rod builders, but when demonstrated it is startling to see the remendous amount of air that boils out of mixed high-build finish. It is dramatic proof of the bubble problem.

One technique that should always be used with any high-build finish is to pour it out on a flat surface as soon as it is mixed. Your palette can be any flat, clean, non-plastic surface. A piece of aluminum foil works well and makes clean-up a snap. (Don't, incidentally, pour *thin* finishes onto a palette.)

When poured out on a palette the finish spreads out, producing a much bigger surface area. Any bubbles in the surface film can break, allowing the air to escape. You can aid this process by blowing a stream of air onto the finish. A drinking straw or a piece of broken hollow blank will enable you to direct the stream of air back and forth over the surface, creating a depression and helping to expose bubbles so that they break. By spreading out the mixed fiish, you will also slow down the catalytic curing action, thereby providing more working time. To apply the finish to the rod, simply dip you brush into the mixture on the palette.

Some rod builders flame a high-build finish in an attempt to remove the bubbles and temporarily improve the flow properties of the mixture. They use either a propane torch (which can be dangerous) or an alcohol lamp. If using the propane torch, they make a number of rapid passes of the flame across the mixture while in the palette, just before applying it to the rod.

Flaming is done after all the wraps have been coated with the high-build finish, and in the same sequence. The idea is to *briefly* warm the finish so that it thins momentarily, releasing bubbles and flowing more smoothly. The flame is passed back and forth fairly rapidly beneath the rod, never allowing the heat to pause in any one spot. If you see a tiny puff of smoke come from a spot of finish you know you allowed it to become too hot. Stop. Immediately dip your brush into mixed finish on the palette and apply a full coat of finish to the spot that smoked. If you do not do this, the spot of overheated finish will cure with an orange-peel surface.

Flaming gets mixed reviews. Some people swear by it and others swear at it. If you try it, do some experimenting on an old rod or piece of scrap blank. Use your color sealant beneath the high-build finish. Also, make certain that all containers of any solvents or flammable adhesives, etc., are tightly capped and removed from the immediate area. Do not flame a high-build finish to which you have added solvent for thinning purposes.

My own recommendation would be to solve your trapped-air and bubble problems *before* they start by thinning the high-build finish, using the technique described above.

Another problem can occur with any finish but is much more likely to show up with high-build finishes. It is characterized by craters in the finish, or fish-eyes, spots where the finish has pulled away from the thread. Sometimes a patch of finish will be irregular and convoluted on the surface rather than smooth. The cause, you may remember from our initial discussion of thread contamination, is silicone or oils.

Many times you can see the crater or fish-eye form while you are still applying finish to another wrap on the rod. If you go back and brush finish across the blemish it will look fine. A few minutes later it may again appear. When this happens, you can be sure that you have a silicone (or oil) problem.

Only rarely can you trace the source of the silicone. One such example would be the use of lubricated medical syringes for measuring instead of nonlubricated syringes. Usually it's impossible to know exactly where the silicone came from. The biggest suspect should be any implements that you used which were made of plastic. Why? Because plastic items are made in molds, and a separator—usually silicone-based—is used to facilitate removal from the mold. In other plastic molding operations, stearate (stearic acid) is included in the resin. Heat causes it to "bloom" to the surface for mold separation. The stearate, however, continues to migrate to the surface-forever.

Silicone is not the easiest thing to totally remove from a surface. Some plastics are really quite porous when seen under a microscope. These pores can retain silicone or other oils through a number of hot, soapy washes, then later release some silicone. Keep in mind that we are talking about only a minute amount needed to foul up a bit of beautiful thread work. This is why you can do something 99 times without any problems, then get clobbered on the 100th try.

What to do? The best course is to avoid using *anything* made of plastic for a measuring device, mixing container, a stirrer, or a palette. In other words, adapt the same stringent requirements against using plastic as we recommended for the thin finishes. Here, we are not concerned about a solvent in the finish attacking the plastic as we are with thin finishes. What we are concerned with is the addition of a minute amount of silicone to our finish, our brush, or our wraps. It takes only an infinitesimal amount to contaminate the finish on some rod some day. It's just not worth the chance.

When applying high-build finishes to the guide wraps, try to spread it so it does not produce an overly thick coating. I have the best results by holding the brush against the end of the wrap and rotating the blank to transfer finish. I then brush that finish along the axis of the rod, using horizontal brush strokes. A straight edge is produced at the other end of the wrap by again holding the brush against the rotating blank.

If you use high-build finishes, you really should use a low-r.p.m. rod dryer. If this is not done, there is a high probability of runs and sags. Any low-r.p.m. motor can be used. We did some tests a few years back to see if any one speed was best. There are a lot of variables such as blank diameter, actual viscosity of the finish, temperature, etc. On the tests, 15 to 20 r.p.m. seemed to be ideal, but you can use any motor from about 2 to 25 r.p.m. An old barbeque spit motor is fine.

The rod should be supported by rod rollers or a couple of thin Vee blocks. Their height should be matched to the motor so that the rod is level and horizontal. There are many ways to attach the butt of the rod to the motor shaft, including inexpensive, very light-duty chucks from rod-building supply houses. On light freshwater rods, I did fine for years using just masking tape. I would center the rod butt on the center of the motor shaft by adjusting the height of my rod roller supports. Then I would spiral masking tape around the motor shaft and the butt, alternating directions of the spiral. The tape was bent around the parts as necessary, then pushed, even crumpled, tightly in place.

For heavier rods with large guides, you need a more secure connection than masking tape. The chucks mentioned are excellent. RodCrafter Joy Dunlap attaches his heavy offshore trolling rods with a homemade rig. He uses about a six-inch length of Keystock, which is driven into an empty one-ounce thread spool. The spool is turned down on the end to accept a length of automobile heater hose. He has made up several sizes to fit various-diameter rod butts. A hose clamp is slipped over the hose to hold it to the butt.

Testing finishes

You will, no doubt, at one time or another want to compare finishes or test new ones. This is the best way to learn firsthand about some of the important properties of a wrapping finish. It is certainly better than accepting the manufacturer's claims, or the opinions of others such as myself.

Start with flat pieces of aluminum foil, about 20 square inches (10 x 2 or 3 x 7 inches). Give each piece of foil two coats of the finish with the recommended time between coats. Allow the finish at least a few days to a week to cure thoroughly. For a weight comparison use a good reloading scale, or get help from your friendly pharmacist. Abrasion resistance is fairly difficult to test at home, or even compare. You can try rubbing one spot on each finish for a certain number of minutes with a mildly abrasive rubber eraser. Then compare to see if there is any apparent difference.

To test flexibility and adhesion, first pull the strips repeatedly at a 90° angle over the square edge of a table. A good finish should be able to stand up to a great many such flexes. Next, crumple the piece of foil into a tight ball, then open it flat on a table. Check for cracks and separation. Here again, a quality finish should show no deterioration after many such crushings.

Next take scrap pieces of medium- to large-diameter blanks. Wrap bands of different-colored thread, about $^1/_4$ to $^1/_2$ inch wide, against each other. Use a variety of colors and make sure NCP white is one of them. Apply three coats of color preserver in the usual manner to just *one side* of each blank (along the axis). Wait twenty-four hours after the last coat, then give the entire blank a couple of coats of the wrapping finishes being tested. After they have cured, examine the colors. See if the side with the color preserver retained the original color. Compare the color-preserver side to the other side to determine how much color shift occurred. To see if there is a color cast to the finish, or if one occurs as a result of reacting with the color preserver, check the white band on both sides of the blank. Finally, place the pieces of blanks outside in the sun and weather for a few weeks to see what changes or reactions occur, if any.

NINE

Tools

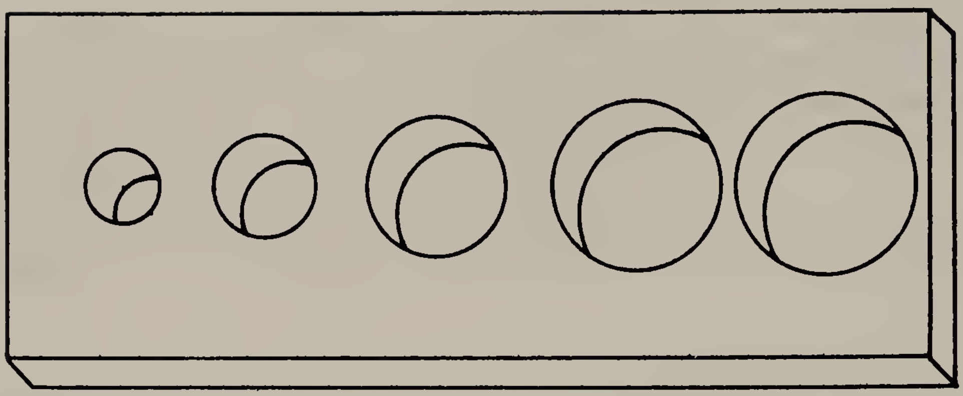
Very few people who try custom rod building make only one rod. They find the endeavor so fascinating and the end product so much better than a factory rod that they just naturally build more rods. As they do, many discover needs for various tools to simplify a particular function or to enable better control of quality. The ingenuity of rod builders in this regard is amazing, especially when we consider that custom rod makers come from all walks of life with widely differing backgrounds.

Every issue of the *RodCrafters Journal* has had at least one article on tools designed by rod makers. Some, such as George Fish's Thread Tool and James R. Youmans's adjustable-height ball-bearing lathe supports, have had such broad application that we have had them manufactured for sale in our supply business. One is quite simple, the other more complex, yet either can be made by the reader.

Because of space limitations it is impossible to list here all of the many excellent tools designed by RodCrafters. We have tried to select a broad enough variety to show different aspects of construction and different ways of solving a common problem. The way to use this chapter, then, is to find those ideas and designs that best fit your needs, shop facilities, and available materials. No doubt you can then add your own personal design twists and come up with a tool ideally suited to you and your needs.

TOOLS FOR CORK WORK

As cork rings are glued to the blank it helps to have a tool to push each firmly against the previous one. A good tool for this purpose consists of a board with various-size holes drilled in the center. These holes should be slightly larger than the butt diameters of the blanks you normally work with. After the cork is glued in place the board is slipped over the blank. By grasping the ends of the board you can push the corks firmly together. If you are using thin contact cement on the faces of the rings combined with epoxy on the blank, the tool is excellent. Slip the board in place and tap on it with a hammer for a solid contact-cement joint.

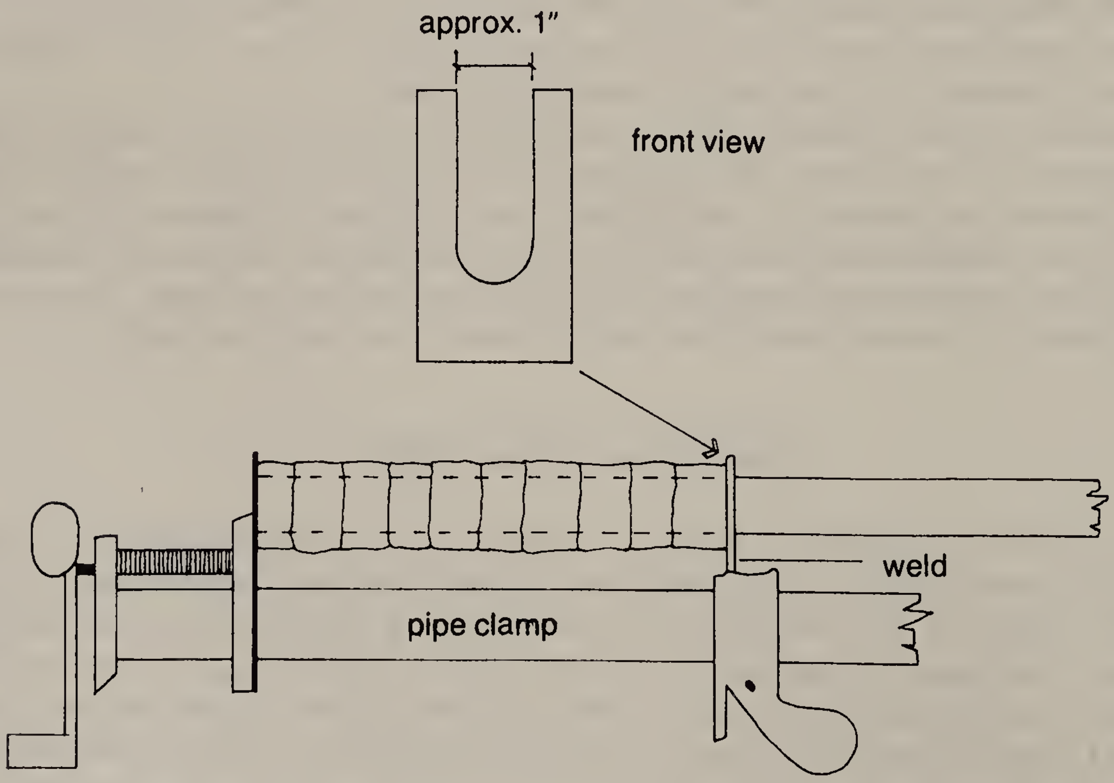


Pushboard with various-sized holes for seating cork rings and pushing resilient grips along blank.

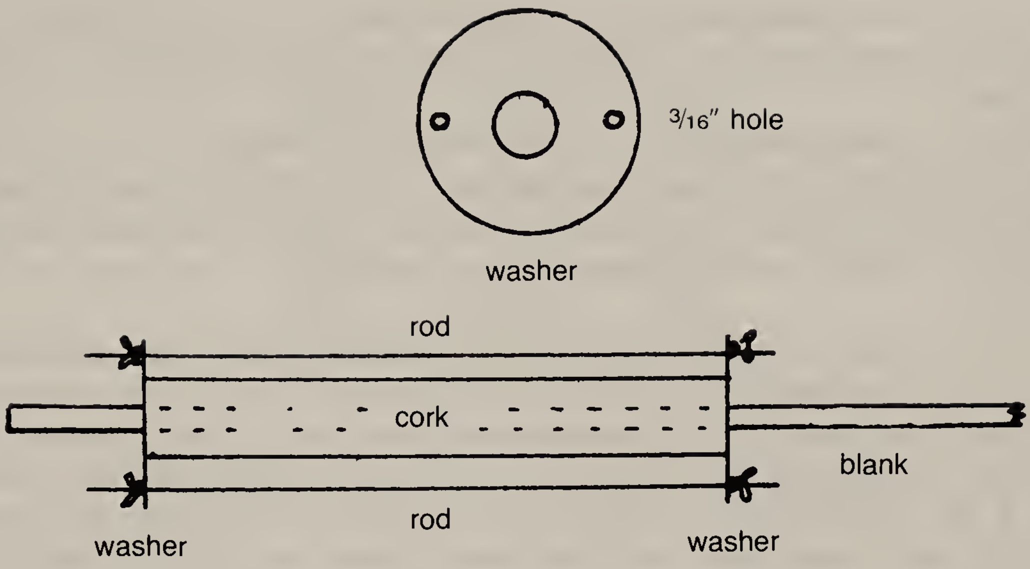
When the glue being used calls for clamping, or when it is felt that mild clamping of cork rings will help, a number of tools can be used. For example, short lengths of rings can be clamped with a standard caulking gun. This is a simple way to make short lengths of cork cylinders from which grips can be fabricated. For clamping rings glued to the blank, RodCrafter James L. Merlock modified a regular adjustable pipe clamp. He had a U-shaped metal plate welded onto the adjustable end. This slips around the blank, but retains the cork rings. On a spinning rod, for example, he first glues and clamps the butt grip. When it is dry he fits, then clamps, the reel seat and foregrip.

A different approach is used by RodCrafter Earl C. Davidson for gluing cork rings onto a blank. His jig consists of two large washers $1/8 \times 15/16 \times 2\,1/4$ inches O.D. In addition to the center hole, each washer has two smaller $3/16$-inch holes drilled near the rim and 180° apart. Other parts of the jig include two $3/16 \times 10$-inch threaded rods, two nuts, and two wing nuts to fit on the threaded rods.

After the cork rings have been glued in place on the blank, the washers are slipped over the blank so that one is at each end of the cork cylinder. The threaded rods are inserted through the rim holes, and the nuts, followed by the wing nuts, are placed on the



Jim Merlock's modified pipe clamp.

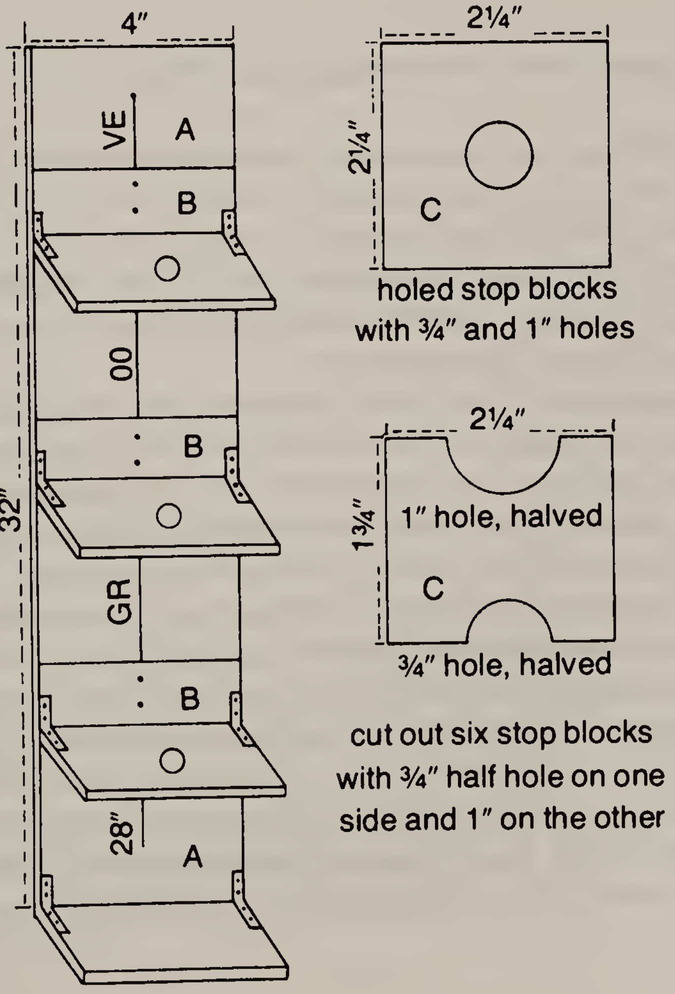


Cork clamp of large washers with 3/16″ holes and lengths of threaded rod.

ends of the rods. The nuts and wing nuts are tightened to square and clamp the cork rings until the glue dries.

The tool is versatile and the dimensions can be varied to fit your needs. On a rod with a fixed reel seat, one washer can be placed against the cork on one end, and the other washer placed on the far side of the reel seat on the other end. This draws the cork tightly against the reel seat.

A more complicated but extremely versatile cork clamp was designed by RodCrafter Clifford G. Webb. Basically, the device consists of a ½×4×32-inch backboard (A) with a fixed block at one end, three sliding blocks (B), and a set of cut-out and holed stop


4″
VE
A
B
00
B
GR
B
28″
A
32″
2¼″
2¼″
C
holed stop blocks with ¾″ and 1″ holes
2¼″
1¾″
1″ hole, halved
C
¾″ hole, halved
cut out six stop blocks with ¾″ half hole on one side and 1″ on the other

Cork clamp designed by C. G. Webb

blocks (C). The three sliding blocks are adjustable along a ¼×28-inch groove, cut into the center of the backboard, by means of two ¼×1½-inch carriage bolts with washers and wing nuts.

Each of the sliding blocks has a 1¾-inch hole bored through the center to permit the blocks to pass over any cork project using rings up to 1½ inches in diameter. This permits positioning the sliding blocks, as required, anywhere along the backboard. Thus, the jig can be used on any type handle, including gluing both parts of a split-grip surf handle at the same time.

The cut-out blocks are used along with the sliding blocks. They prevent the cork rings from passing through the large hole in the sliding block when it is positioned against the cork rings being glued. One of the holed stop blocks has a ¾-inch-diameter hole and the other has a 1-inch hole. These holes are center-bored, enabling the stop blocks to be passed over the rod tip or handle shaft and placed against the project being glued. On some projects, only a holed stop block is necessary, and on others, the cut-out stop blocks are required as well. When using the cut-out stop blocks, it is necessary to use two of the blocks at each sliding block position.

In use, a stop block is placed against the cork with a sliding block behind it. The wing nuts are tightened firmly and the top of the sliding block is tapped very lightly with a hammer. *Caution:* Do not force the blocks too tightly against the cork rings. To do so will distort the rings and cause them to pull away from the blank. Only light pressure, sufficient to keep the rings pushed securely together, is required.

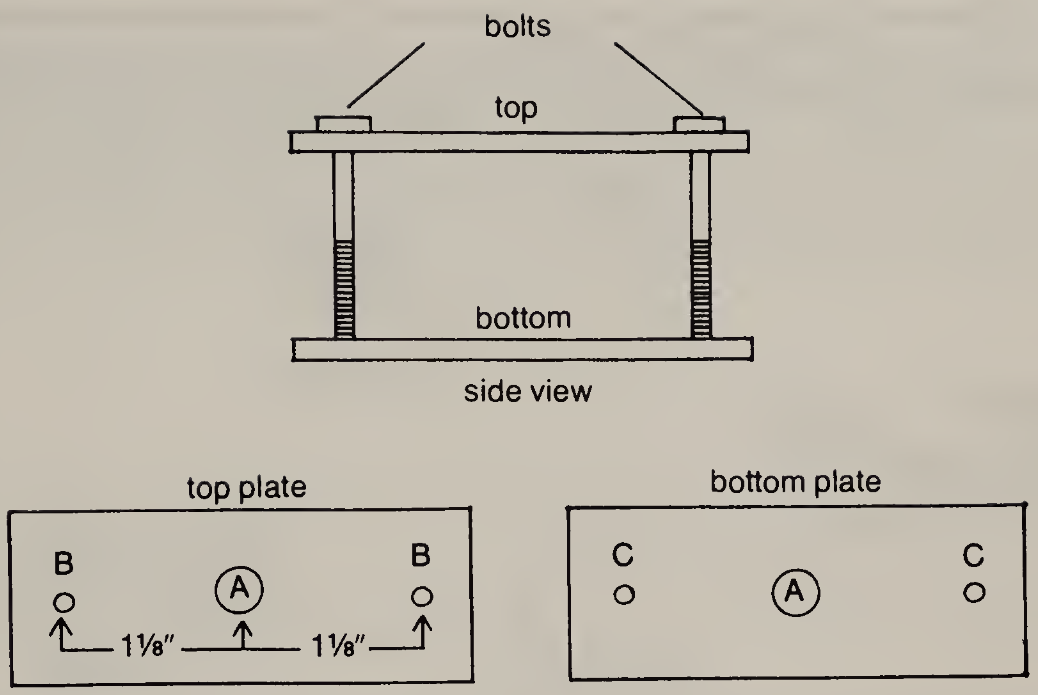
The tool is quite versatile and adaptable to all kinds of handles. For example, the entire handle of a one-piece surf rod can be clamped. Use one sliding block and one holed stop block at the foregrip and place the butt of the rod against the fixed block at the end. Dimensions can be varied to fit requirements. A smaller version using only one sliding block may fill your needs adequately.

HOSEL AND TRIM RING CLAMP

The method explained in *Fiberglass Rod Making* for fabricating hosels and trim rings of wood, plastic, or combinations thereof is based on using a hole saw. Most of these utilize a ¼-inch drill bit in the center. The resulting ¼-inch center hole must usually be enlarged to fit the diameter of the blank. RodCrafter Ken Wiebe designed a clamp for holding these pieces without marring them when enlarging the center hole. This otherwise can be a problem with tapered hosels and butt caps.

The clamp consists of two plates of flat iron ¼ inch thick by 1½ inches wide by 3½ inches long. Holes are drilled and tapped to accept two 2×⅜-inch Nat. Course Std. bolts, one on each end of the clamp. Holes of the desired diameter to match the blank are also drilled in the center of the plates. In use, the tapered hosel is slipped between the two plates and aligned with the center holes. The bolts are then tightened, and the entire assembly held in a vise for drilling out the center of the hosel (see diagram).

To make the clamp, use a center punch to mark the top plate for the "A" center hole and the two "B" holes (see figure). Clamp the top and bottom plates together and use a ⅛-inch drill bit to drill through both plates for all three holes. Separate the plates and use a ⅜-inch drill bit to enlarge the "B" holes only, on the top plate. Next, take the bottom plate and use a 5/16-inch drill bit to enlarge the "C" holes only. After drilling the "C" holes, tap them with a ⅜×16 N.C.S. tap to provide threads for the two bolts. The center "A" holes can be drilled to whatever size required for the diameter of the blank.



Hosel and trim-ring clamp.

RESILIENT-GRIP TOOL

Resilient grips are mounted by hand, using the technique explained earlier. If you mount a lot of grips, and especially if they are long grips on large blanks, you may want to consider using compressed air and this tool designed by James S. Nagao. You will, of course, need an air compressor. If you already have one, you are more than halfway home.

Start with a one-inch-diameter schedule-40 PVC tube. This has a maximum allowable working pressure of 450 P.S.I. The length of the tube should be 12 inches more than the longest one-piece rod you expect to build. The end of this tube (A in the drawing) that comes in contact with the grip should be perfectly square since a seal is required to build up pressure.

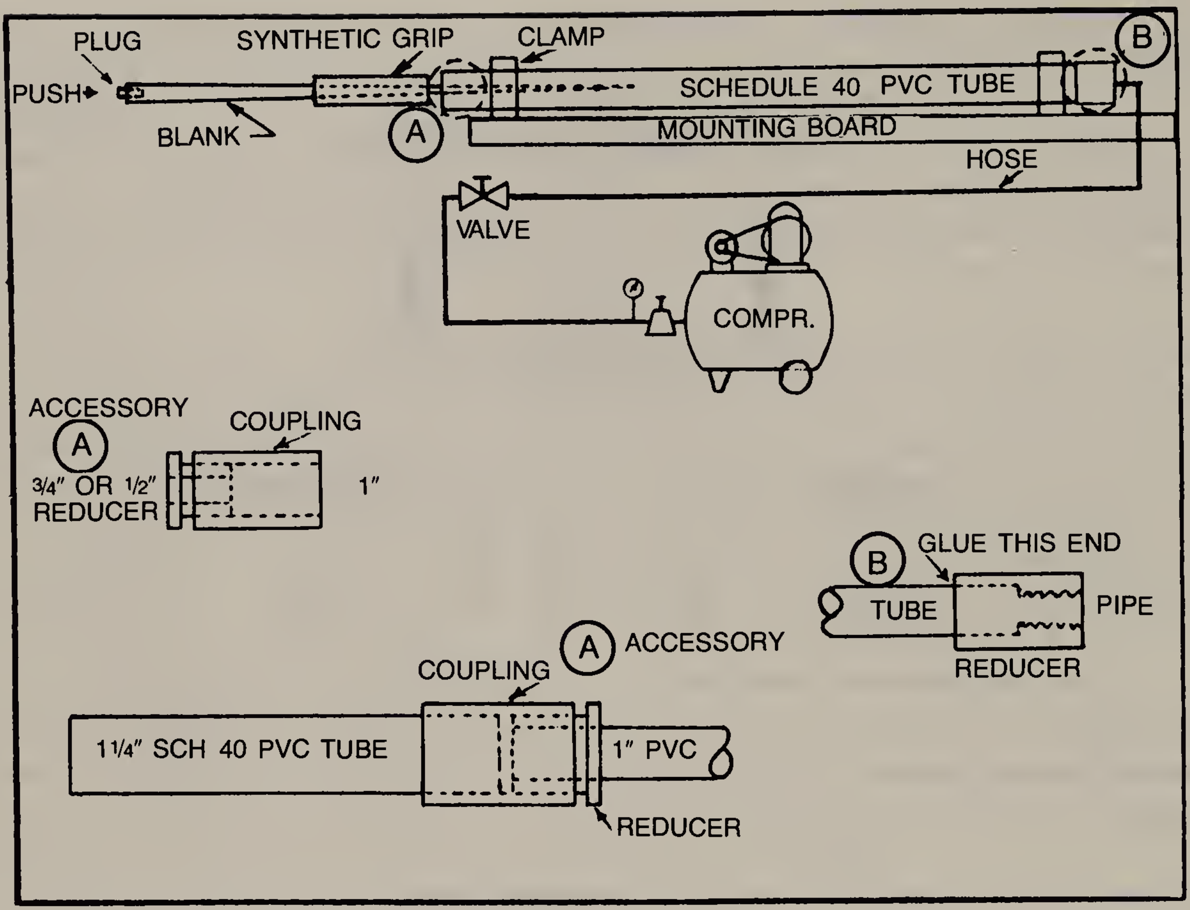
To be able to mount grips of different sizes on blanks of different sizes, acquire a one-inch schedule-40 coupling and a 1¼-inch coupling. Also, get some various size schedule-40 reducers (see drawing). The reducers and couplings at "A" on the drawing are not glued in place.

At the other end of the tube (B), the required reducer is glued in place. This is where the air line is connected. A quick disconnect fitting on the hose will be helpful for portability and storage.

On most installations, 20 to 60 P.S.I. is sufficient. Use the lowest air pressure that will do the job. Epoxy glue is spread on the blank *only* on the area to be finally covered by the grip—and the higher the air pressure, the more glue you will displace.

The butt end of the blank must be sealed off to prevent air from escaping through the blank. If a butt cap is going to be used, mount it and allow a few days for the glue to cure. An alternative is an assortment of slightly tapered, long rubber stoppers to be used as plugs.

The mounting of the one-inch PVC pipe is best left to the individual rod builder to fit his shop and available space. Jim mounted his on a long board with two clamps. This makes for easy storage when not in use.



Air-compressor tool for mounting a resilient grip.

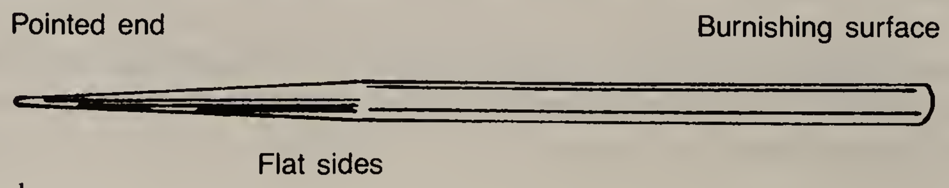
To use the tool, slide the grip down the blank to the point where it becomes snug. Next, slide the blank into the tube until the grip is against the end of the tube. Turn on the air and the grip will expand slightly, floating on a cushion of air. Just gently push on the blank, feeding it into the tube until the grip is in the desired position. Turn off the air and remove the blank with the grip mounted.

THREAD TOOL

I have already referred to this clever little tool so many times in the chapter on wrapping that you probably expect some kind of magic wand that will make the wraps for you. Obviously, it won't. But it will do all the things mentioned, and I'm so sold on it that I think every custom rod builder should have two of them. RodCrafter George Fish designed it and kindly sent me a couple. Now I don't know how I ever got along without them. I still keep finding new uses.

Its beauty lies in its simplicity and utility. Take a piece of $^{3}/_{32}$-inch-diameter stainless-steel drill rod. A length of 4 or 4½ inches works just fine. Round one end on a grinding wheel. At the other end, grind about one-third of the length to a level taper, but do not bring it to a real fine point. Next, flatten the taper on three or four sides.

You now have the desired shape, but all edges must be heavily buffed to completely



Thread Tool.

smooth and polish the entire tool. Use a buffing wheel and plenty of rouge. Make sure the flattened sides and the point are all polished slightly round. The point should be soft enough that it will not scratch anything. The whole tool must be smooth enough that it will never snag wrapping thread. Test it on a piece of woman's nylon stocking.

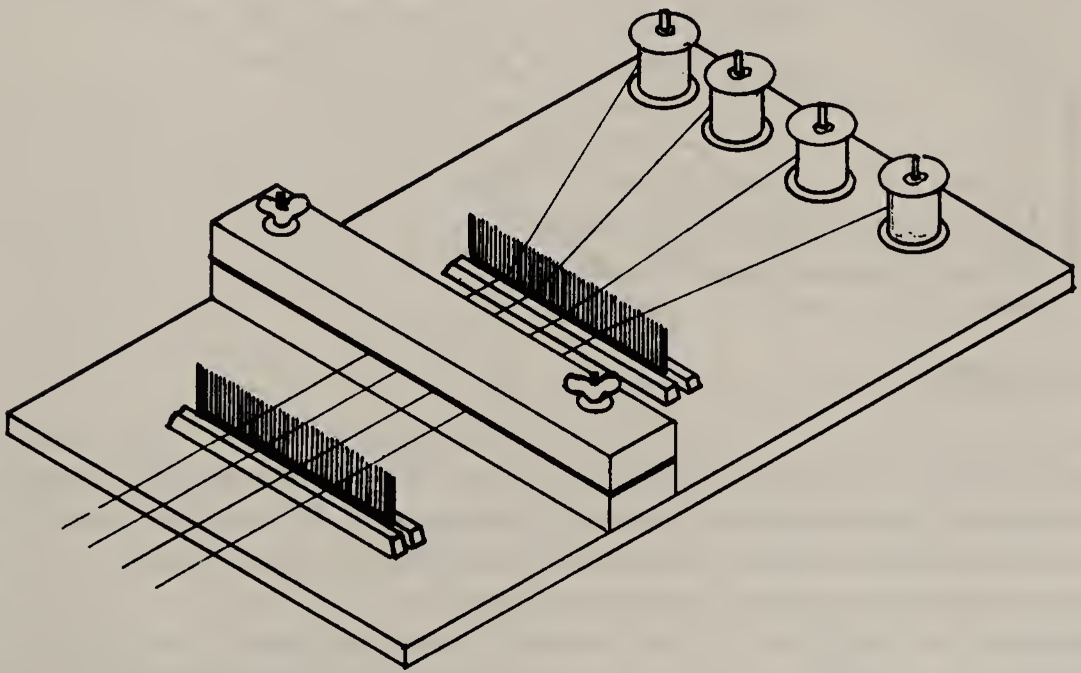
I won't try to list all the uses, just the main three functions. The round sides make an excellent burnisher. The soft point enables you to position individual threads on intricate butt wraps. And the flattened edges work beautifully for packing threads tightly together.

FOUR-THREAD WRAPPING TOOL

If you make many cross wraps in which you wind bands of up to four threads wide, and have difficulty in keeping the threads from twisting, you might want to consider making this tool. I first saw it in use at a National RodCrafter Seminar by its designer, Don Dewey. Neglecting to get a photograph, I may have changed the original design somewhat. However, as in building any tool or jig, we all do some redesigning and adjusting. The basic principle is what is important.

What is required is a board on which four vertical pegs are mounted to hold the thread spools, a device to adjust tension, and a method of keeping the threads separate and untangled. Any arrangement of parts which will accomplish this is fine. The unit could be built on a wood base that could be either clamped or screwed to the workbench. An alternate for stability would be weighting the base with lead.

A simple arrangement would have the pegs (dowels) on the rear of the base. From there the individual threads could pass through a common hair comb mounted vertically. The comb could be set between two low pieces of wood glued to the base, and the comb held between them with nonflowing epoxy such as PC-7. Next, the threads would pass through a thread tension device that would keep the threads separated. This could be a pair of boards mounted on bolts from beneath the base. The bottom board could be glued to the base while the top board floated on the two bolts. A number of layers of paper could be glued to the face of each board to prevent raising fuzz on the thread as it passed through under tension. Alternative facing of the boards could be sheets of smooth plexi-



Four-thread wrapping tool.

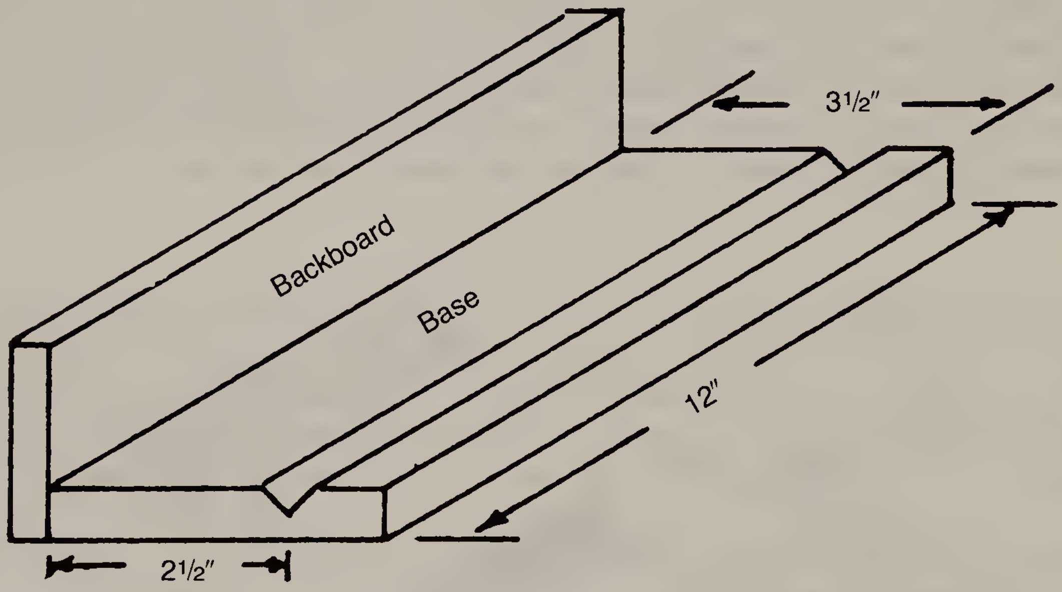
glass with the edges rounded. Two wing nuts and washers would top the bolts and be tightened to provide tension on the thread. Just in front of the tension device, and along the front edge of the unit's base, another comb could be mounted.

To use the unit, the wing nuts are turned to open the space between the tension boards. The threads are then passed through the teeth of the first comb, between the tension boards, and then through the teeth of the second comb. The wing nuts are tightened for the desired thread tension. The ends of the thread are brought together in front of the unit and a piece of masking tape is placed across the band of thread. This keeps the thread from becoming twisted after it leaves the last comb. The thread is then taped in place on the rod and the band wound on. At the end of the wrap for that band of thread it is taped in place on the rod. Before it is cut with scissors, a piece of tape is again placed across the band of thread to keep it from twisting.

BUTT-WRAP ALIGNMENT TOOL

This tool, designed by RodCrafter Donald Dewey, is so helpful in laying out a decorative butt wrap that I have come to think of it as indispensable. You will need to buy one part of the tool, a draftsman's circle template with a wide range of hole sizes. Each circular hole should have four marks around the outside, separated by 90°.

The main portion of the tool consists of two 12-inch-long and 1-inch-thick boards joined securely at exactly 90° to form an L. On the base, at a distance of 2 1/2 inches from the backboard, rout or cut a V-groove. This must be *perfectly parallel to the backboard* and runs the full 12-inch length of the base. The depth of the V-groove should be about 3/8 inch or deeper, depending on the size of the blanks with which you normally work.



Butt Wrap Alignment Tool.

Next you need a 12-inch-long piece of material that is dimensionally stable, one that will not warp or change size in the slightest. Clear plexiglass is excellent, as is aluminum if you have the tools to work it. This piece is called the top plate and must be cut exactly 2 1/2 inches wide *with the sides perfectly parallel.*

Directions for using the tool to lay out a cross wrap are given in the chapter on wraps and wrapping technique. The base with the V-groove is also invaluable for holding the blank when making any inscription on the rod.

WRAPPING JIGS

If you are going to wrap more than an occasional rod, you will find it worth your while to build some kind of wrapping jig. Basically this consists of a support on which to rest and rotate the rod, and a device for applying easily adjustable thread tension. We are talking here of an entirely hand-powered jig, as distinguished from a power wrapping tool. Some of the tools, however, can also be pressed into service for an occasional use with power for various operations.

When designing and building a wrapping jig you should give some thought to where it will be placed. The working height must be comfortable *for you,* and it must fit into your available space. Perhaps it also will have to be collapsible for storage, or portable. Consider also the direction from which you prefer the thread to come. Some like it to feed from behind the blank, others from beneath and in front. The jig also will have to be long enough to provide steady support for the longest rod you are likely to build. Long one-piece rods will require three supports instead of two. Of necessity, you will have to take into account your skill and working familiarity with various materials, their availability, and the shop resources at your disposal.

Casters

Perhaps the most commonly used supports for rod wrapping are furniture casters. These are available in various diameters and in two styles of mountings. One style comes on a small metal plate which attaches with four wood screws. The other style is on a metal rod which fits inside a hole in the bottom of furniture legs. Either style can be used; it's a matter of which you find the most convenient to mount.

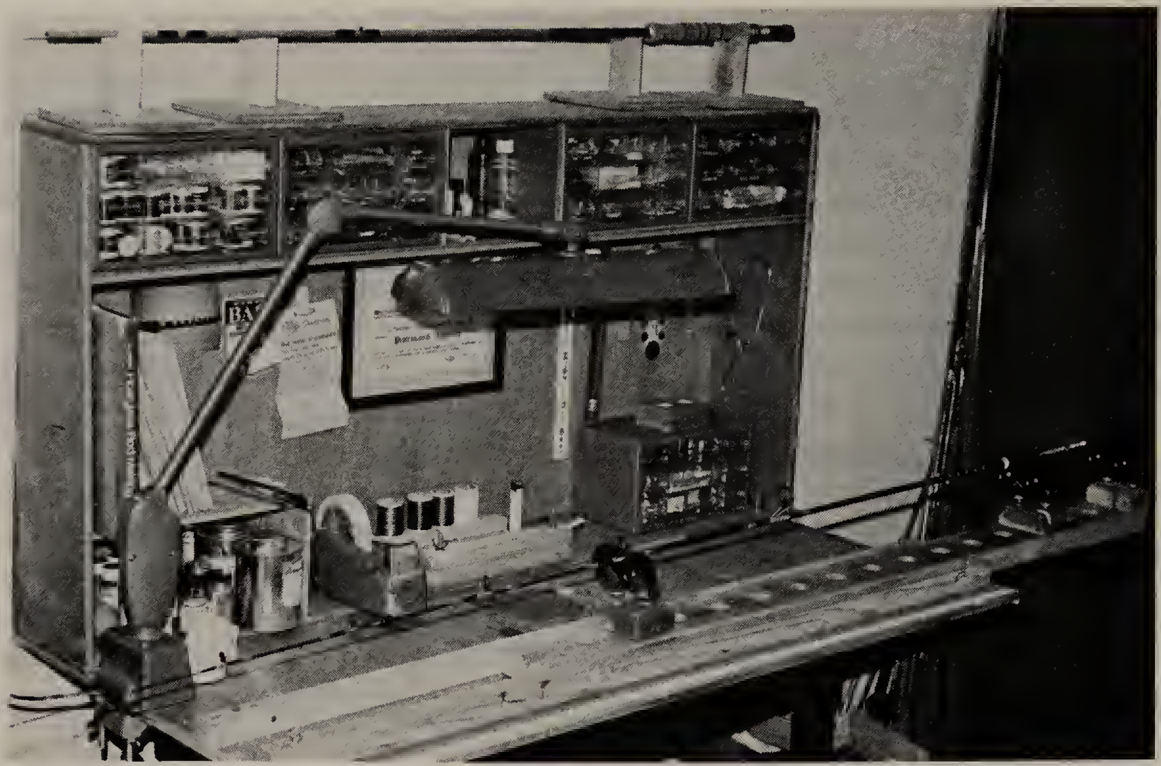
When mounting casters they must be close enough so that the fine-diameter tip section of rods will not slip between them. Ideally, they should just touch each other so that when one rotates it causes the other to rotate. However, plastic casters of this type are not always perfectly round. If one of them has a high side, it may bind if mounted too close. You will have to check this when mounting any pair of casters, and adjust the distance between them so they rotate freely.

Most of these casters are also made to swivel, many being mounted with ball-bearing raceways. For use as a rod support, you do not want them to move from alignment with each other. So, plan to immobilize the swivel mechanism by any convenient means. A hole can be drilled and a pin inserted, or nonflowing epoxy, such as PC-7, can be molded around the base to prevent swiveling.

If your workbench is of about the height that you find comfortable, the casters can be mounted on blocks made of pieces of 2 × 4 lumber. These can be notched on the bottom to slide along a rail mounted on your workbench. The rail can be attached to the bench top with two countersunk screws, one at each end. When not in use, the rails can thus be removed and the wrapping supports stored.

Casters also cradle the rod on RodCrafter Donald B. Doggett's wrapping jig. His tool permits adjusting the position of the caster blocks so they will not move, yet the entire rod support can be slid to any position desired. This is possible by a sliding bar which holds the caster blocks. The bar is a 4½-foot length of 2 × 4, sanded smooth on all sides. The bar slides freely between two guide strips of 1 × 2 lumber. These rails are mounted to the workbench by a 3/16 × 4-inch bolt and wing nut on each end for easy removal.

The sliding bar has ½-inch-diameter holes drilled ¾ inch deep and 3 inches apart along the center line of the bar. These holes accept ½-inch-diameter by 7/8-inch-long dowels which are glued to the bottom of the caster blocks as shown in the photo. (A

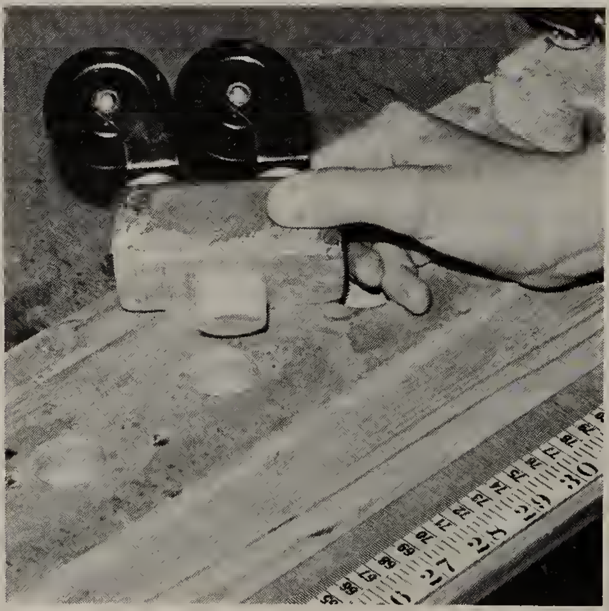


Bar and casters slide to one side for positioning of rod.

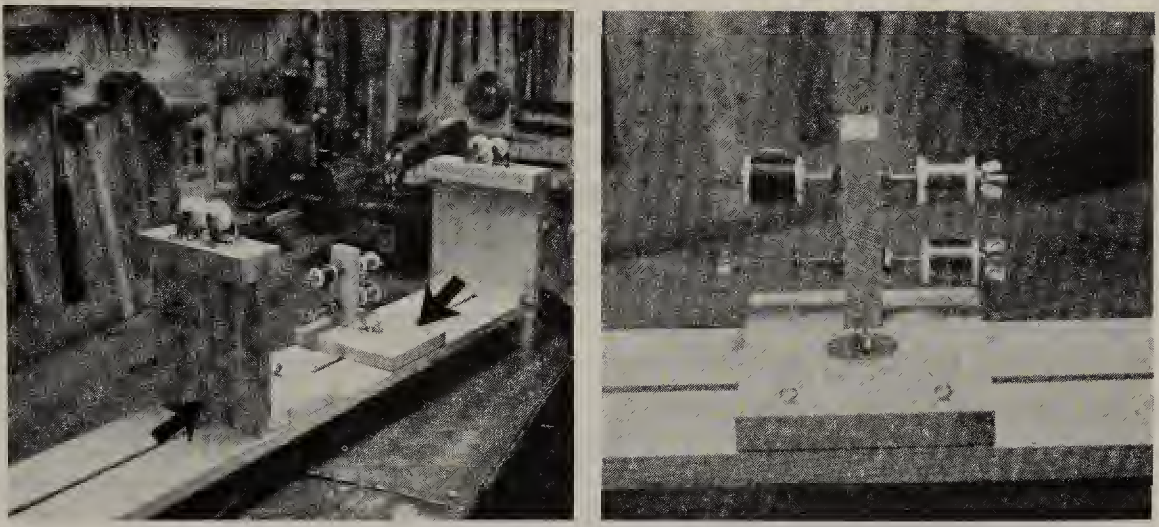
broom handle makes a good-sized dowel for this purpose.) This method of construction enables the rod builder to quickly position the roller blocks where desired. The entire rod support can then be slid to the right or left without actually moving the rod on the rod rollers.

Don uses three roller blocks. When working on one end of a rod, such as the tip, he slides the bar to one side and places a roller block on one end of the bar and two on the other end. The rod is thus perfectly supported. The sliding feature enables constant alignment with his thread holder, and is a definite asset when applying wrapping finish. He can then slide the entire unit without risk of smearing the finish at any guide.

A different type of rod-wrapping jig utilizing casters is used by RodCrafter James C. Reigle. His system may be applicable for you if you want to raise the height of your rod supports, or if your workbench is low. It also feeds the thread from below the blank rather than from behind it.



Pieces of dowel on bottom of caster blocks fit into holes in sliding bar.

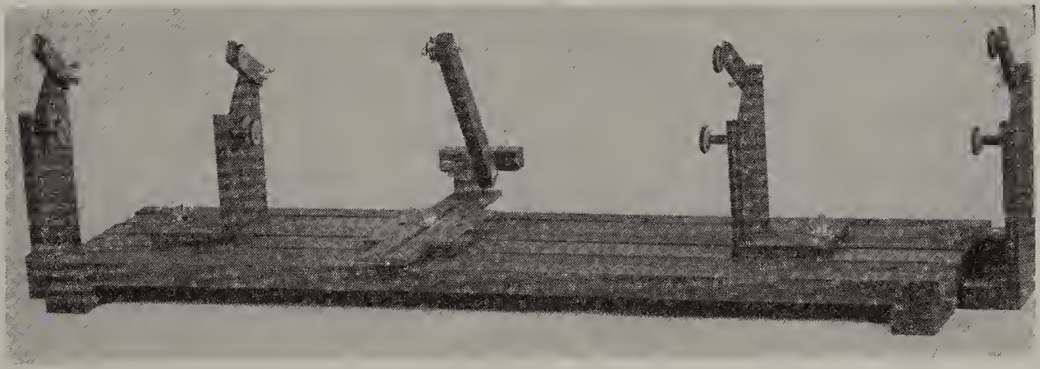


Rod-wrapping jig by James C. Reigle. Thread holder and upright marked by arrows are adjustable along slot in base.

He uses two upright sections, each topped by a pair of rollers on which the rod is placed. The casters are mounted on blocks which are glued to the vertical boards. One upright is permanently attached to the end of a horizontal bed or base made of a wide board. This base board has a slot along its center. The other upright slides in this slot, and is attached with a wing nut. This enables easy adjustment for different length blanks.

The thread holder is mounted on the base beneath the rollers. Its position is also adjustable along the slot and is similarly attached with a wing nut. The thread holder consists of a center mounted upright on a base. Through the upright are mounted two lengths of ¼-inch threaded rod, secured on both sides by a nut and washer. Over each protruding section of threaded rod is mounted a small spring for tension, the spool of thread, a washer, and finally a wing nut for tension adjustment. There are two eyelets mounted on the baseboard. The thread runs from the spool, through the eyelets, and up to the blank at an angle. This arrangement permits seeing the thread as it comes off the spool.

Along with many other rod builders, I had to get into the act and design a rod-wrapping jig. Since it was to be for sale in our supply business, one of my objectives was versatility to accommodate different wrapping styles and various lengths of rods. The original design was done before the first edition of this book. Since then, a number of improvements have been incorporated and it has passed the test of time. We now make it from hardwood and apple laminate wood.



Wrapping jig of my design, shown closed, opens to 98 inches. All rod supports are rubber-tired ball-bearing rollers. Thread tension can be positioned where desired and you can feed thread from in back or front.

The length when closed is a storable 33 inches. In use, two rod-support arms extend from the main frame to a maximum length of 98 inches. On the end of each extension arm there is a ball-bearing rod roller support unit. The same ball-bearing units top the two movable inboard rod supports. These units consist of two ball-bearing rollers on the bottom which cradle the rod. On top is a third adjustable-position ball-bearing roller. This third roller can be lowered on the blank and locked, or simply pushed out of the way. These four rod supports can each be positioned where desired to hold the rod best.

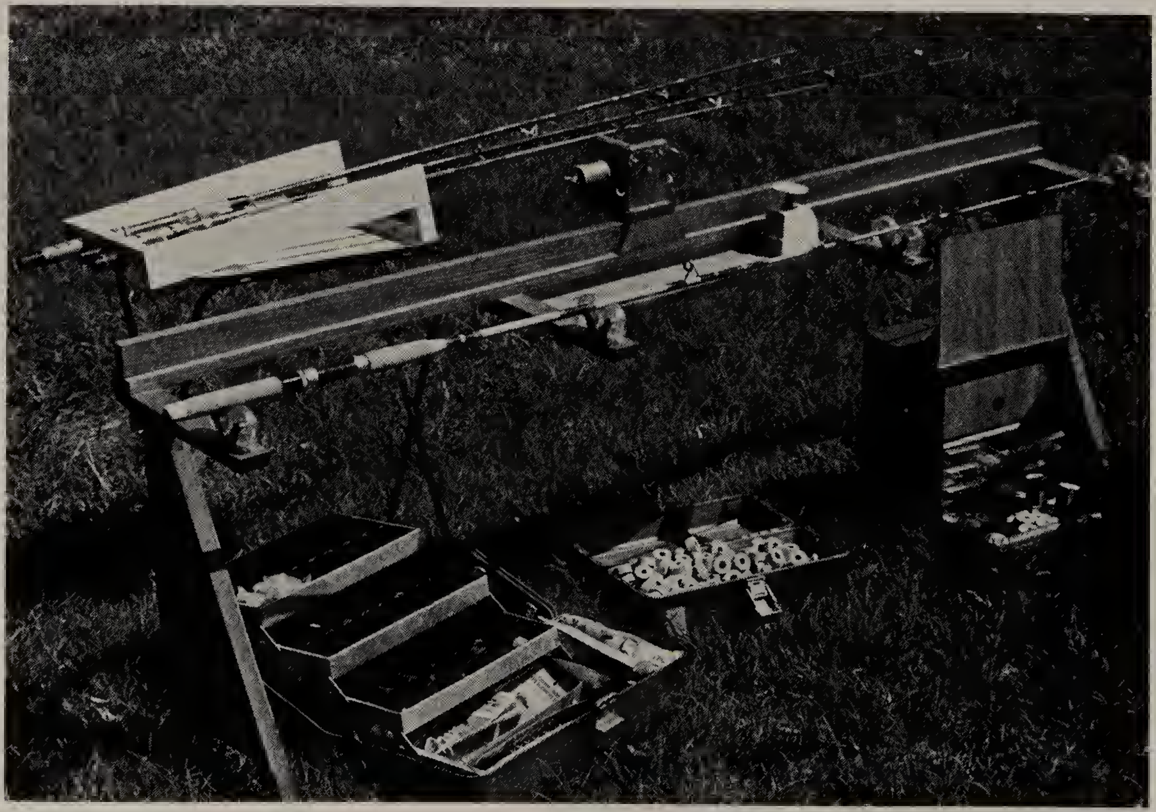
A very efficient and versatile thread-tension system consists of an adjustable arm, on the end of which are highly polished, cupped discs with a spring and thumb screw. This swinging arm is mounted on a baseboard that fits in a groove and can be moved left or right along the groove. It can also be slid forward or backward and locked in any position. The rod builder can therefore place the tension device so that the thread comes from above and behind the blank or below and in front of the blank.

Another method of mounting casters for use as rod rollers is on horizontal boards that project out in front of the workbench. This has the advantage of allowing room beneath for one's legs. The boards that hold the rollers need only be as wide as the mounting brackets on the bottom of the casters. They can be permanently attached to the workbench, or designed so they are removable.

RodCrafter Lee Call incorporated this method in his portable rod-building jig. He spends his winters in Aransas Pass, Texas, but makes his home in Kansas. The idea of a portable shop has many applications. For someone with limited space for a rod-building jig, such as in an apartment or a mobile home, it could be ideal. Let's look further at Lee's equipment, which he designed and built mostly of scrap lumber.

The rod-winding rack is 6 feet long and there are four sets of horizontally mounted rollers. A small shelf is built between the center two roller supports, and serves to hold incidentals while at work. The legs at each end are attached with hinges to permit folding.

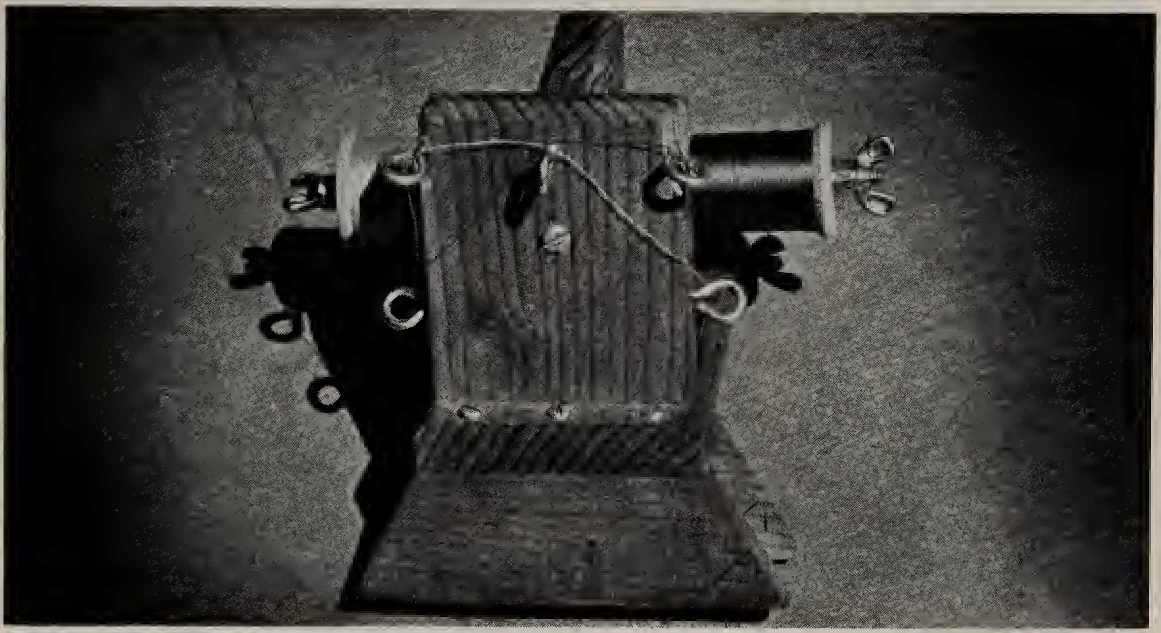
The horizontal bed of the bench is built so that the thread spool holder slides the complete length, from one end to the other. This enables Lee to move it from point to



Portable shop by Lee Call uses horizontally mounted rollers.

point along the rod as he wraps each guide. It is always parallel to the rod blank, maintaining the wrapping thread at a consistent right angle to the rod.

The thread holder is pictured separately. The parallel boards at the bottom slip over the bed of the winding rack. Each of the two bolts that hold the spools of thread has a spring for adjustable thread tension. The bolts are sufficiently long to hold 100-yard, 1-ounce, and 4-ounce spools. The thread passes from each spool through a series of screw eyes to deliver, when desired, both threads together at the rod. Lee uses this arrangement, since his favorite wraps are two-thread wraps.



Thread holder slides on parallel boards and uses screw eyes to route thread.

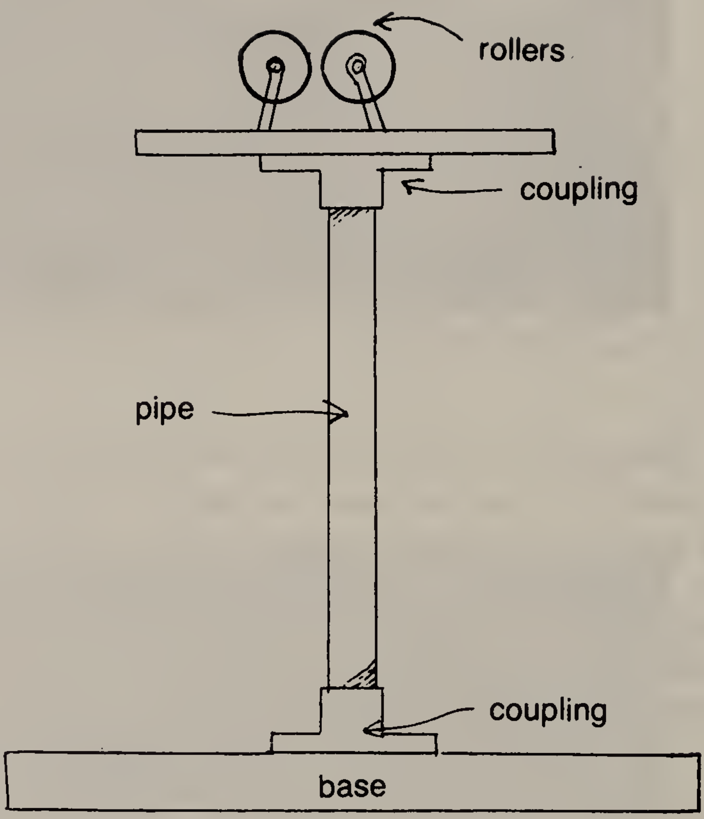
Going back to the first photo, the white boxlike unit in the rear is a rod-drying rack. Two short legs raise the open end slightly, placing the unit on an angle to the horizontal. The opposite end is closed and has circular slots on the bottom to hold the ends of the rods. In the middle is a crosspiece which has circular slots cut from the top. In use, a rod handle is placed over the middle piece and the butt is slipped under the closed end. The weight of the rods holds the handles in position and the slots keep the rods from accidentally touching each other.

Cork rings, guides, thread, butt caps and other components and tools are stored in two tackle boxes and a homemade wood cabinet. The swing-out trays with the usual dividers for lures are ideal for keeping parts sorted. Shelves to hold plastic trays of various sizes serve the same purpose in the cabinet. A clever "guillotine" door always closes itself when not in use, and the cabinet has a convenient carrying handle on top.

Rod rollers made of casters are occasionally used for other purposes besides cradling the rod while it is hand wrapped. One common use is for supports when rotating a rod with a barbecue-spit motor while a heavy finish cures on a decorative butt wrap. Of less frequent use, due to whipping of the rod, is to support it when power underwraps are made. In all probability, the height of the motor and the power supply (such as a sewing-machine motor) is different in each case. Unless one wants to mount each of these power sources on a bracket so that they will all be of the same height, or to make a set of separate rollers of a height for each application, the obvious answer is make the height of the rod rollers adjustable. RodCrafter Earl Davidson shared some solutions in the *RodCrafters Journal* that could be helpful, here, to the reader.

A pair of rollers can be mounted on a plate. On the underside of the plate a common,

Portable shop folded for storage or transport.



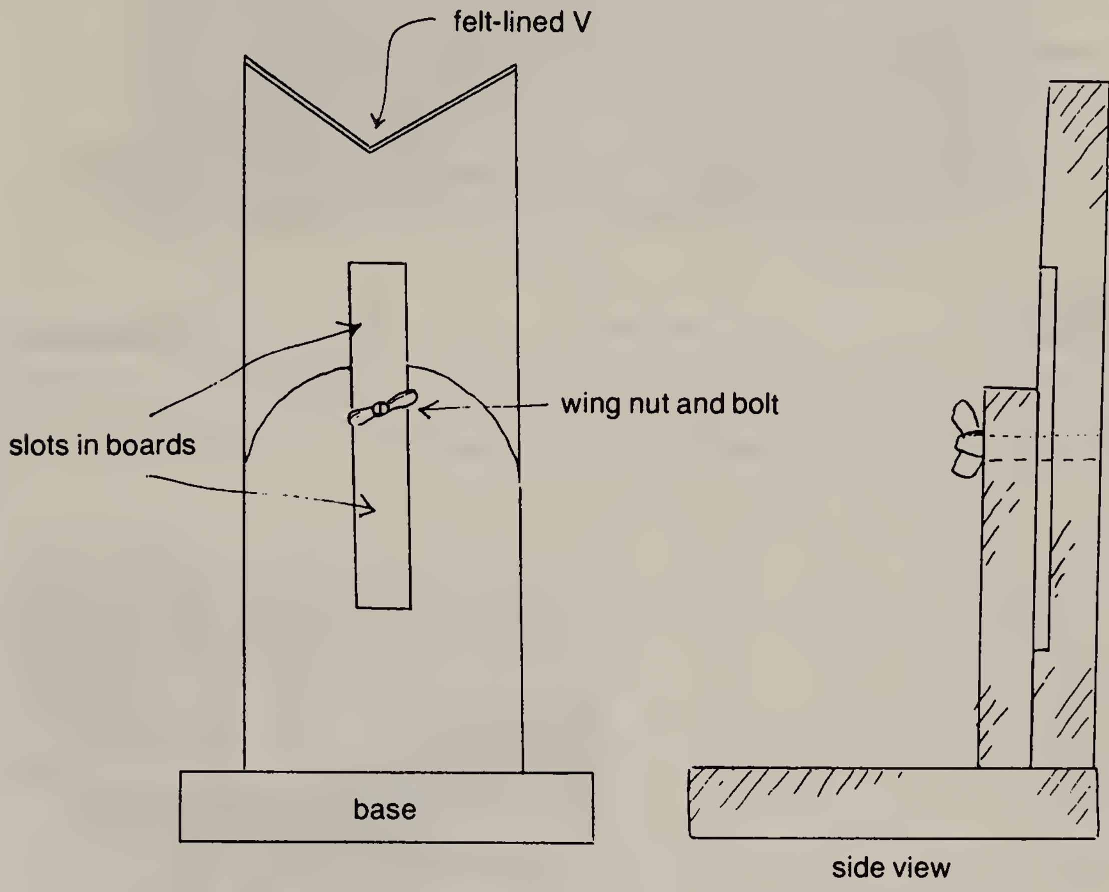
Height of rod rollers is adjustable by using different lengths of pipe.

threaded female coupling is either epoxied or screwed. A heavier base plate with an identical threaded coupling, mounted on top, serves as a base or stand. Between the two plates a length of pipe with threads to fit the couplings is inserted. Different lengths of pipe to provide the exact height for each piece of equipment is all that is needed to adapt your supports to the specific job at hand. A variation would be that instead of threaded couplings and threaded pipe, smooth bore couplings with a hole and set screw be used with matching-size unthreaded lengths of pipe.

V-blocks

Departing from the use of casters, another approach to rod supports can be used. These consist of wood uprights with V-shaped cradles at the top. Earl Davidson also detailed how this form of rod support could be made adjustable for height.

Onto a sturdy block base is mounted a vertical board with a slot in the center running most of its upper length. A matching vertical board with the center slot on the lower end is attached with a bolt and wing nut to the first. By loosening the wing nut, the height can be adjusted as needed, and then tightened securely in place. If rollers are preferred, a wood block is mounted on top of the second board, and the rollers attached to it.

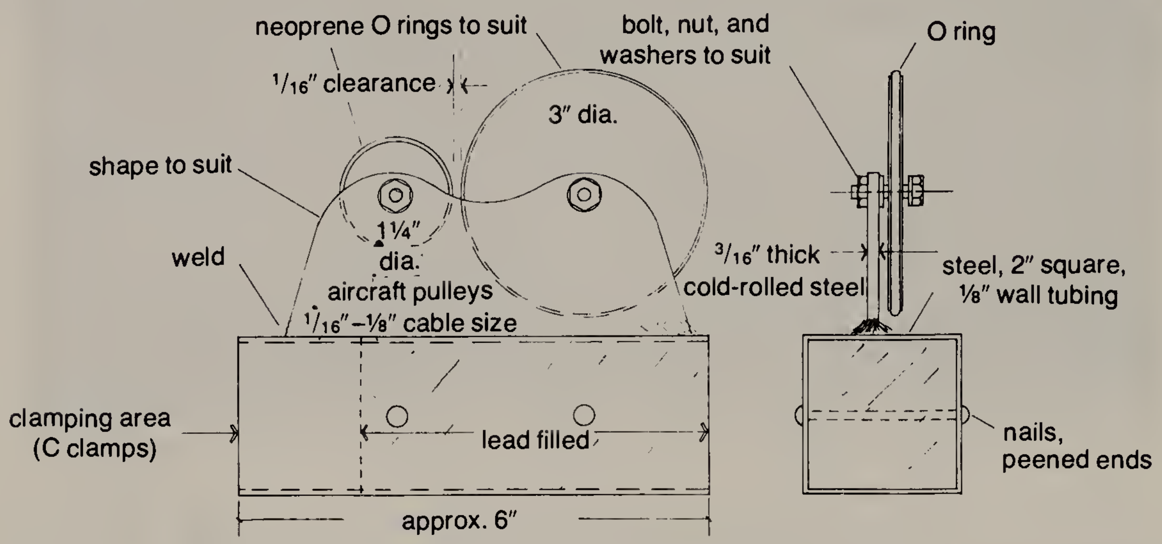


Adjustable-height V-blocks.

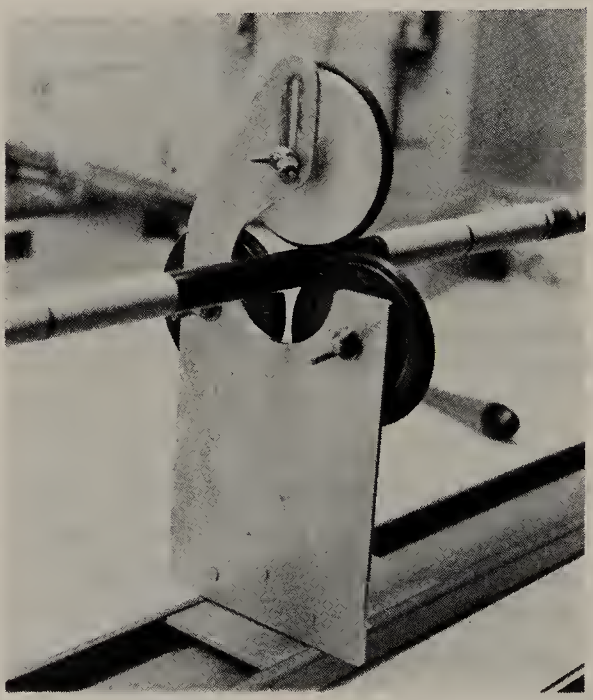
Now that we have broached the subject of V-blocks for rod-wrapping supports, let's take a closer look. They can be used in most any jig that would use casters for rod rollers. They are most usually made of upright boards, which should not be too thick to keep down friction. Most commonly they are lined with strips of felt glued to the wood. RodCrafter Sid Sloan feels he has found a better material that is easier to apply. Available at most drugstores, it is Dr. Scholl's Kurotex, and comes in rolls 7 inches wide and 2½ feet long. It has an adhesive back that sticks to any clean surface. It can be applied not only to V-blocks, but to the surface of nylon casters for a soft touch. To reduce friction, RodCrafter Erv Svetz lines his V-blocks with strips of teflon.

Custom rollers

"Ball-bearing rod rollers with tires" is what RodCrafter Carl Reinisch calls his rod supports. To make a pair of rollers he used ball-bearing aircraft pulleys with a groove for 1/16-to-1/8-inch cable. One pulley is 3 inches in diameter and its mate 1¼ inches in diameter. The larger pulley is arranged to be closer to the thread tension unit. Used this way, the blank will not climb over the large pulley as easily as when both are the same diameter. The "tires" are O-rings to fit the grooves. If O-rings of the proper size cannot be found, larger ones can be used. Just cut them as required, join the butts together, and glue them in place. When cutting O-rings, do not stretch them, since they have a memory and will subsequently contract.



Rod rollers of aircraft pulleys with rubber O-rings, designed by Carl Reinisch.

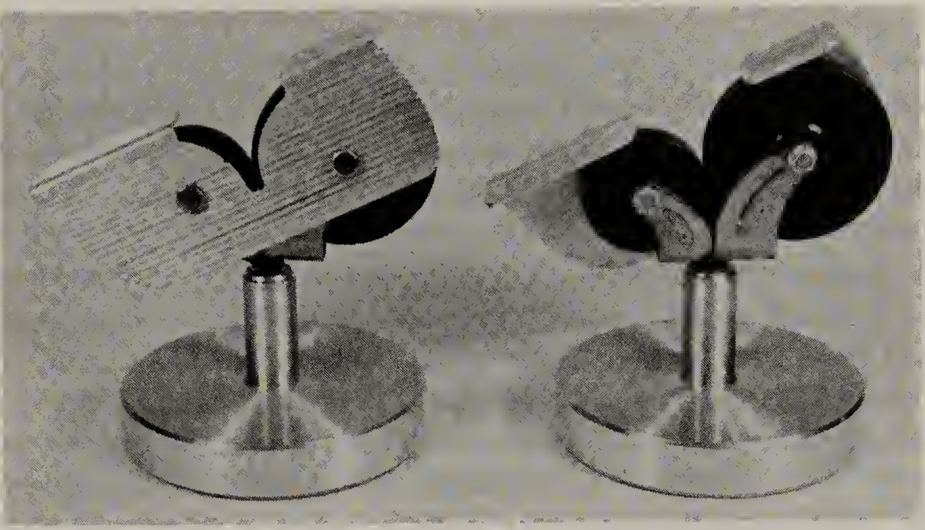


Three aircraft pulleys with rubber O-rings used as rod rollers by Al Clark.

Rollers of this type can be supported in any one of the previously described ways. Carl used a section of 2-inch-square steel tubing and some 3/16-inch-thick steel plate. The plate is shaped to match the pulleys. The tubing forming the base was drilled to accept a few nails whose ends were peened over. The tube was then filled three-quarters with lead to provide weight and stability. Two such roller units are used.

If you are a machinist, or have a friend who is, you may want to consider the very handsome, functional rod rollers and combination thread holder and tension machine along the lines of the one built for me by the late RodCrafter Beryl Ross. Just about all the parts are made entirely of solid aluminum bar stock.

The bases of the rollers are 5 inches in diameter by 7/8-inch thick with 1/8-inch-thick plastic foam on the bottom. The upright is an integral part of the base and is tapped and

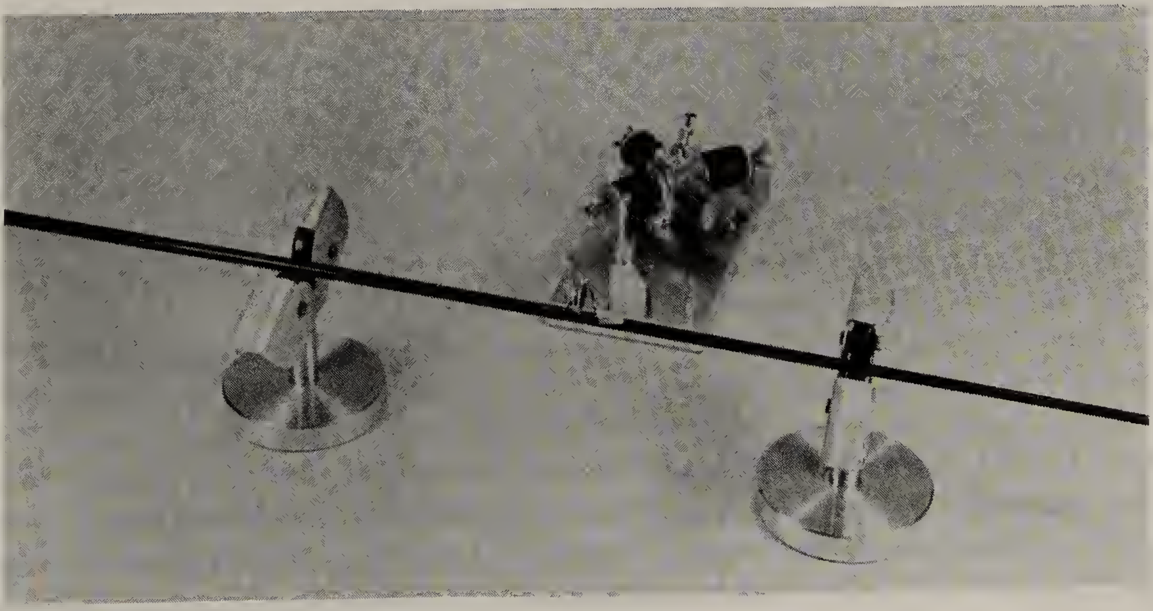


Rollers of hard rubber with hand rests, built by Beryl Ross.

threaded to accept a bolt welded on the bottom of the roller housing. The large roller is 2⅞ inches in diameter and the smaller one is 1⅞ inches in diameter. Both are of hard rubber, ½ inch thick. A $^1/_{16}$-inch-thick aluminum plate is contoured to fit the rollers and bent over the top to form two hand rests. I have found these rests to be extremely helpful while wrapping. A third roller without hand rests is used for long one-piece rods.

The thread holder and tension machine are attached to a 5¼ × 10¾ × ⅞-inch solid aluminum base. This also has 1/8-inch plastic foam on the bottom. Slightly to the rear of center is mounted the thread holder with four 3-inch rods. These are threaded on the end to accept a wing nut in addition to a spring and washer, thus permitting individual spool tension adjustment. To accommodate small 50-yard spools, ½-inch spacers are first slipped over the rods. These spacers are stored on four corner posts. On the thread holder there are also two tip-tops. The entire thread holder rotates and can be locked in any position with a wing nut on top.

Along the front of the base is mounted a sewing-machine adjustable thread tension device. Between it and the thread holder there is a tall spring-steel rod with a tip-top on the end. This serves as a visual indicator of the tension on the thread. The thread goes from the spool to a tip-top on the thread holder, through the tension device, to the tension indicator, and then to the rod. A dust cover of ⅛-inch-thick clear plastic fits over the entire thread-holder unit when it is not in use.



Thread holder and tension machine by Beryl Ross.

POWER WRAPPING TOOL

Let's immediately differentiate between a rod lathe and a power wrapping tool. A rod lathe must be more powerful in order to turn grips, hosels, etc. It needs a much stronger connection between motor and rod, and must revolve absolutely true on its axis with no vibration. By contrast, a rod-wrapping tool needs only enough power to turn the rod against thread tension. A light-duty connection is all that is required, and it is not necessary for the rod to rotate precisely true and vibration-free. It is used for making underwraps, and as you get good enough, guide wraps.

Ideally a wrapping tool should be able to be rotated easily by hand to facilitate the starting and ending of wraps. This precludes pulleys and gears as speed reducers, or the turning resistance of a powerful motor. Most frequently power is provided by a sewing-machine motor with a variable-speed foot pedal. Sewing-machine motors turn at 5,000 rpm, which proves a bit fast for many rod builders. An educated foot is required to depress the pedal to a minimum. One solution is an electronic speed-reducing control which varies motor speed from zero to full with no loss of power.

For attaching the rod to the motor shaft any of the devices listed later for use on rod lathes can be employed. However, only a light-duty connection is required. A common method is to use a variety of sizes of rubber crutch tips and/or butt caps. A hole is drilled in the center and a washer and bolt inserted from the inside. Another washer and a nut are placed over the protruding bolt. The bolt is slipped into a small, keyless chuck or a simple sleeve, that locks over the motor shaft and bolt. The crutch tip or butt cap is slipped on the rod (minus butt cap). If a tighter fit is needed, a bit of masking tape is wrapped on the end of the rod grip.

To support the rod during rotation, rod rollers or padded V-blocks can be used. It is preferable if the height of the motor on the supports is slightly adjustable. This allows mounting the rod with just the least bit of pressure against the supports in order to help reduce whipping.

My first lathe, which I built for myself, didn't do all those things. It was primarily a shaping machine. As I improved and developed it to the point where it was saleable, it became a rod lathe and performed most of the functions listed. We still sell that lathe and it consists of a ball-bearing powerhead, a universal three-jaw chuck, and a variable-speed foot pedal. It must be combined with separate ball-bearing rod supports and, for wrapping, with the separate Thread Feed and Tension Accessory described earlier for power wrapping. We still sell this unit even though we now offer a Complete Rod Builder's Lathe where all parts are perfectly aligned on a metal lathe bed. In fact, the original unit is convertible to the latest unit so that a rod builder can upgrade his equipment in stages.

My point with all this is to show how you can design and build all or just certain parts of your own lathe. If you take a modular approach, you can add component parts to your lathe which will enable you to perform more functions as the needs develop and as your budget permits. Try to look down the road and anticipate this so that your initial unit can be fitted into your possible expansion plans. Let's try to get a picture of some possible rod-lathe designs and components.

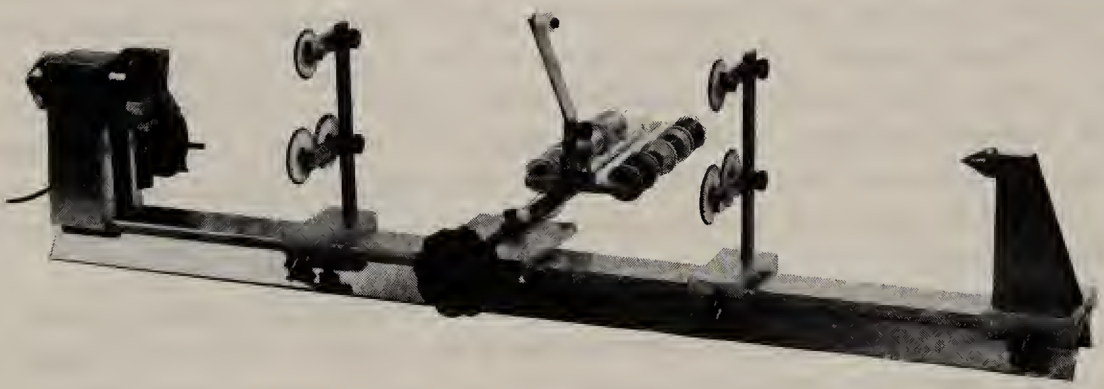
A woodworking lathe will not fill the bill as a rod lathe for several reasons. It does not have a long enough bed between power head and tail stock to accommodate even one section of a typical two-piece rod. Neither does it have a center support. Unlike a rigid piece of a solid wood or metal, a fishing rod is designed to flex. At even moderate rotation speeds a blank starts to whip, or flex, in the midsection between the two end supports. At that point it is no longer revolving on its axis, and shaping a round handle becomes impossible. Rather than trying to modify a wood lathe it is easier, and better, to either buy or build a lathe designed solely for rod building.

There are three primary components to a rod lathe. Starting with the power source, the motor need not be as powerful as that of a regular wood lathe. It does, however, have to be arranged so that it has sufficient torque for shaping all kinds of grips and cutting small wood and plastic parts. The power source must also be stable and vibration-free. Second, there has to be a convenient but strong means of attaching the rod to the power source. Third is the system of supports for the rotating rod. They must eliminate whip and be as friction-free as possible.

ROD LATHES

Obviously, you do not need a rod lathe to build custom rods. However, there are so many things you can do better, more accurately, much more easily, and—best of all—with a lot more enjoyment, that once you have one you will wonder how you ever did without it.

A well-designed rod lathe is both a complete shaping machine and a complete wrapping machine. Here is just a *partial* list of things a good lathe will do. It will shape cork, Customgrip, wood, plastic, and soft metals either on mandrels or right on the rod. With it you can make your own custom parts and components. You can use it with a grinding wheel, wire brush, and polishing wheels to dress guide feet, sand, grind, and polish metals and resin-impregnated wood. You can use a good lathe to mix power and hand wrapping all on the same wrap. You should be able to rapidly and easily make single and multithread underwraps and guide wraps. The lathe should index on every 90° rod axis and lock on any for weaving. It should speed the making of decorative cross wraps not by power but by providing the platform and thread-feed arrangement so you can wrap up to eight threads in a smooth, untangled band, all at one time. Those things and many more can be done with the Complete Rod Builders Lathe, which, although I'm prejudiced, is a terrific tool.



The Complete Rod Builder's Lathe is available in bed lengths of 4, 8, 12, and 16 feet.

Power sources

A quality, heavy-duty sewing-machine motor is capable of delivering the required power if it is used with a system of small, lightweight pulleys of various sizes. This converts the high, no-load speed of 5,000 rpm to much more manageable and workable speeds. Use a pulley belt like a small Gates polyurethane Vee belt to minimize back pressure. Set up the direction of rotation so that the work comes down over the top toward you. Use a variable-speed foot control.

If at all possible, use a ball-bearing spindle-head assembly to reduce friction for shaping and to reduce back pressure for wrapping. If your budget won't allow this initially, stick with an electric drill in a drill stand and wait until your finances improve. Don't try to wrap with the drill set-up, but you can shape things. Resist the temptation to spend on another power source until you can step up to the set-up described above.

Attachment to rod

The easiest method of attachment is a chuck. You need chuck capacity of at least 1¼ inches, and a self-centering chuck is the easiest to use. With the sewing-machine motor, the weight of the chuck must be light. Here again, don't move on a compromise. Stick with the drill or a limited drill-type chuck until you can afford the self-centering scroll chuck with the needed capacity.

If you are using an electric drill for a power source, you already have a chuck. It will be limited to the size drill used, either ⅜ or ½ inch. This will hold smaller blanks if you leave the last cork off, or trim ½ inch or less from the butt of the blank. On a fly rod using a closed-end fly-reel seat, the seat would have to be mounted last, after the handle and any other turning work was completed. There are, however, a number of mandrels and techniques that can be used with a small chuck and a large-diameter blank. These are discussed below.

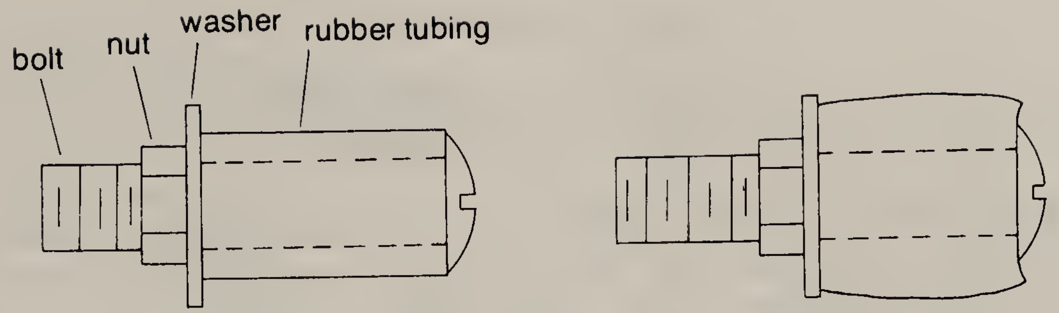
For a direct-drive installation, a work arbor and threaded mandrel to hold a chuck can be employed. If you use the "Crusenberry mandrels" discussed below, you will not need a chuck. Without a chuck you do lose some of the versatility for operations other than turning a blank. The Crusenberry mandrels can be used with or without a chuck.

The mandrels designed by RodCrafter Harry Crusenberry are simple to make and work very well. I have often used them myself ever since Harry told me about them. As noted, they can be used with a work arbor, available at hardware stores to fit most motor shafts (see drawing).

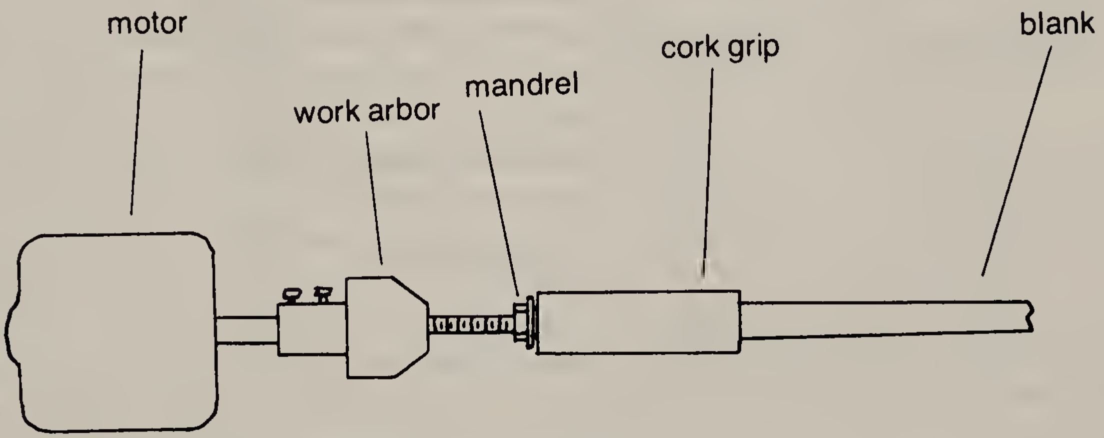
Harry's mandrel is made from a bolt and rubber tubing, held together with a washer and a hex nut. By tightening the hex nut against the washer, pressure is applied to the tubing, which causes the tubing to expand. If you use a piece of tubing that is closely sized to the inside diameter of the blank, the expansion causes the tubing to grip the inside of the blank securely. Since the tubing expands uniformly, there is no wobble as the blank turns. It is automatically centered on the arbor.

The inside diameter of the tubing is important to the effectiveness of the mandrel. The tubing should fit snugly over the bolt. Therefore, to get different sizes for different blanks, use larger or smaller bolts and tubing to fit them. Rubber and synthetic tubing of various sizes is available at auto supply stores and hardware stores. Use the tubing sold for windshield washers, windshield-wiper vacuums, and gas lines, to suggest a few. The diameter of the round head on the bolt must be smaller than the tubing. On very large sizes this may mean grinding down the diameter of the bolt head, as well as turning down the portion of the bolt shank that fits in the chuck.

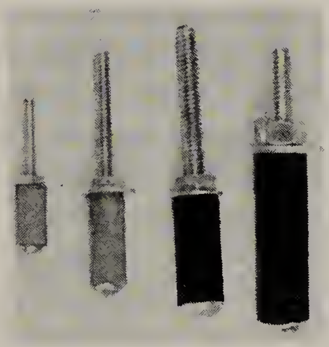
With all of the mandrels discussed that fit inside the blank, it is necessary to leave the butt cap off the rod until all shaping is completed. The recess for the butt cap can be shaped, and when the rod is removed from the lathe the butt cap is glued in place. Any final dressing of the cork to blend perfectly with the outside diameter of the butt cap is easily done by hand with sandpaper or an emery board. On fly rods using reel seats with



Mandrels to grip blank from the inside expand by tightening nut.



Direct-drive lathe with appliance motor, work arbor, and "Crusenberry Mandrel."



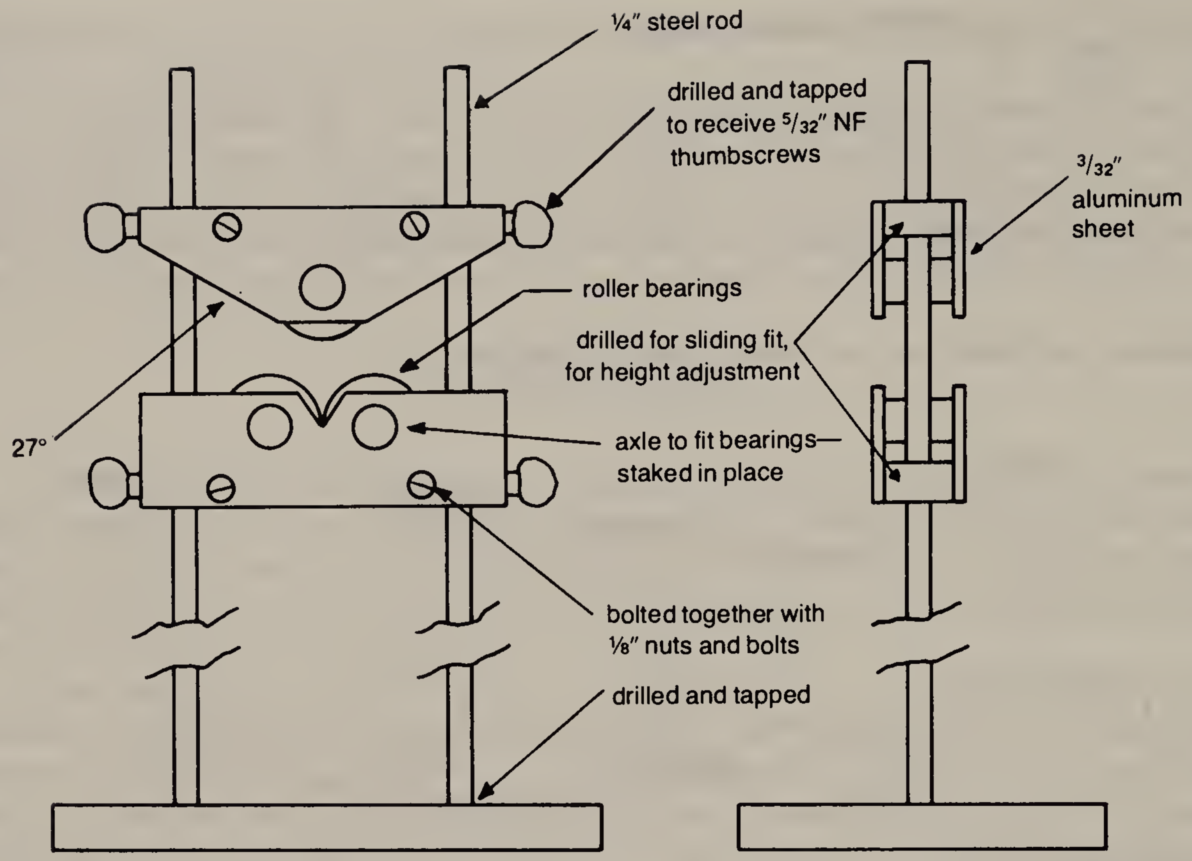
"Crusenberry mandrels" of assorted sizes.

closed end caps, all fitting is done for the reel seat beforehand, but it is not installed until after the turning operations are complete. It is thus glued on last.

Rod supports

The most critical part of a rod lathe is the support system used to keep the rod revolving true in a straight line on its axis. As noted earlier, a blank is designed to flex and will therefore whip when it is rotated at even moderate speeds. A rod lathe must employ a support system to completely eliminate that whipping action. Otherwise, it will be impossible to turn grips or any part perfectly round.

Hand wrapping jigs frequently use rod rollers, and the tapered blank is merely laid across them. When we make a rod lathe we attach the blank with a strong connection at a fixed height. The center line of the chuck can be the same height as the center line of the rollers, but that will not solve the problem because *blanks are tapered,* and we build rods


¼″ steel rod
drilled and tapped to receive 5/32″ NF thumbscrews
3/32″ aluminum sheet
roller bearings
drilled for sliding fit, for height adjustment
27°
axle to fit bearings—staked in place
bolted together with ⅛″ nuts and bolts
drilled and tapped

Adjustable-height ball-bearing rod lathe support designed by James R. Youmans.

on *different size blanks*. We would have to use adjustable-height rollers such as described earlier, or shim each set of rollers to the exact height for the portion of the blank it is to support. Even if we did this we would find it unsatisfactory. At speeds high enough for efficient shaping, the blank starts to vibrate and whip, bouncing up and down on the rollers. So we are back to whip control again. Also, suppose we wanted to shape a wood or plastic hosel directly on the blank. We would then be applying pressure at a right angle to the blank. This will definitely cause it to move or whip on the rollers.

Without belaboring the problems further, what is needed is a rod-support system that (1) can be adjusted precisely to any desired height, (2) will clamp the blank firmly on all sides, making it revolve true, (3) will be practically friction-free to prevent damage to the blank and allow use of relatively low-power motors without strain, (4) can be moved to any position along any length blank, and (5) is itself stable, once in position.

I have been exposed to, examined, and used a wide assortment of rod-lathe support systems. Beyond a doubt, I feel the best and most versatile is the one designed by RodCrafter James R. Youmans. My feelings on this were so strong that we requested he make these so that we could sell them through our rod-building-supply business. It takes Jim about ten hours to make a unit, and he simply did not have the time. We therefore entered an arrangement to have them manufactured for us. However, you can make one yourself, and full directions and working drawings are given below.

The heart of the unit consists of three ball bearings, one on the sliding top plate, and two on the sliding bottom plate. These are 7/8 inch O.D., 5/16 inch bore, and 11/32 inch wide, NICE No. 1603 DC. They are small so that the cross section triangle where the bearings meet will accept small-diameter rod tips.

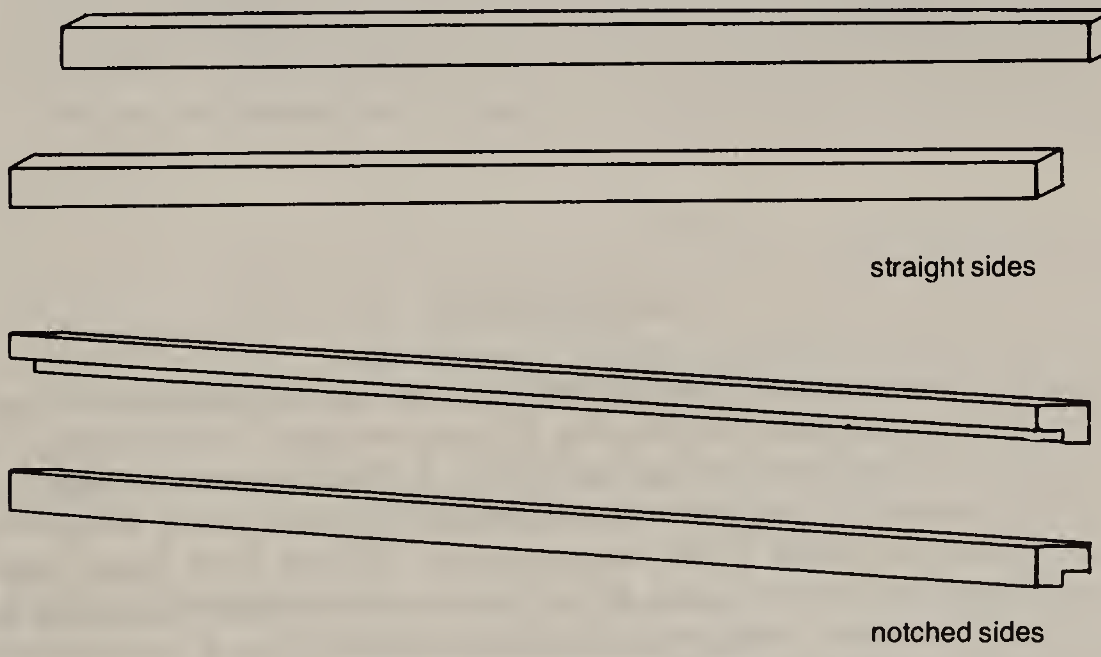
The general dimensions of the unit can be altered to fit your needs. For framing the sliding plates housing the bearings, use 3/32-inch aluminum sheet cut to shape and held together with short bolts. The base plate needs to be large enough and sturdy enough to support the unit. If necessary, in use it can be clamped to the work surface. Half-inch aluminum plate works very well.

The two upright rods, on which each plate with the bearings slides, can be 7/32 or 1/4 inch. On the sides of each plate to lock it in place on the vertical rods, 5/32-inch bolts with wing nuts are used.

To use the unit, temporarily slide the top plate up near the top, and adjust the height of the bottom plate to just below the center of your chuck. Place the blank into the chuck of your power head. Determine where the blank will rest on the ball bearings, and put a few winds of masking tape around the blank at that point. (This will prevent marring, and help make a good fit of the blank against the bearings.) Adjust the height of the bottom plate so that when the blank rests on the bearings it is perfectly level. Lock the bottom plate in place. Now, lower the top plate so that the single ball bearing is right against the blank, and lock that plate in position. The blank is now held securely in place on all sides, but will revolve with little or no friction because of the ball bearings.

When shaping a handle, locate the unit near the middle of the blank. Best stability is achieved, especially on longer or lighter blanks, by using two units. Then one is placed relatively near the handle and the other at the opposite end of the blank. If you do any bamboo-rod repair work, these units are perfect for truing and sizing the rod for ferrule installation. In this situation you would place a support near the end of the rod section where the ferrule is to be fit. The other would be placed in the middle of the rod section. Some wraps of masking tape around the rod convert the five- or six-sided profile to a round shape for easy rotation on the ball bearings.

The units are light in weight and easily portable. They therefore can be used in conjunction with other tools, or for other purposes. If you have a powered wrapping jig, they are excellent rod supports. You will find wrapping is easier since the blank is stable, revolving precisely on its axis. Many rod builders rotate their rods at low rpm while the wrapping finish dries, particularly where a heavy coat of finish has been applied on a butt wrap. A barbecue-spit motor, or other low-rpm motor, is an ideal combination with the rod lathe supports. Since the rod is clamped between ball bearings, there is no danger that it

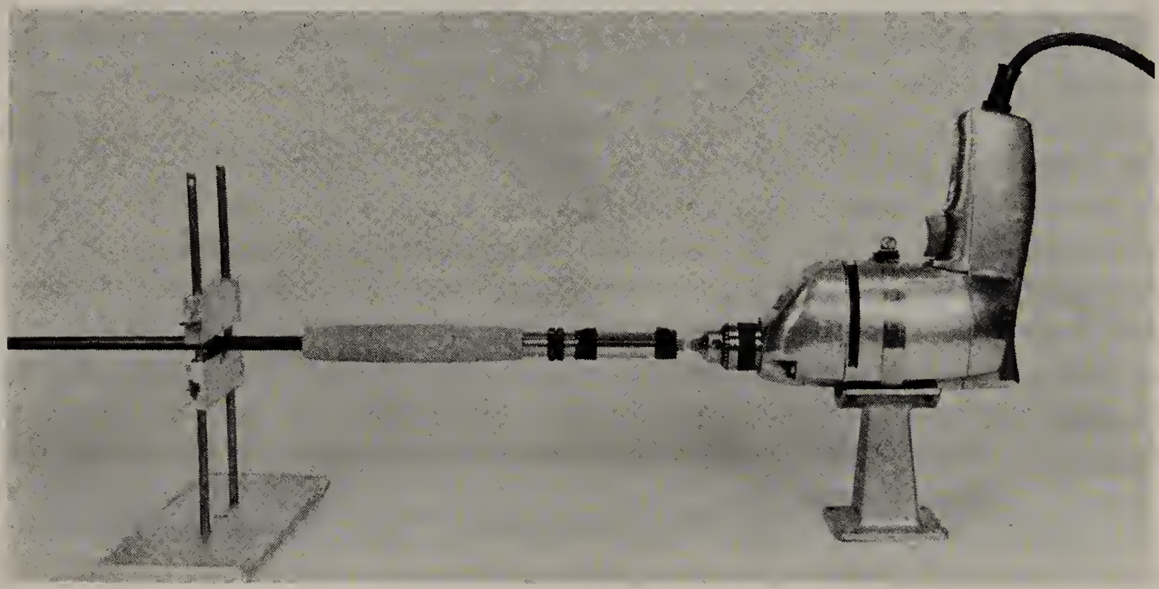


Parallel wood rails can be used as an alignment bed for lathe with Youmans's supports. Rails can be straight-sided or notched to fit base plate.

will fall off the rollers and ruin the finish. With the top plate removed they can even be used as rod rollers for regular hand wrapping. You will undoubtedly find other uses.

It was mentioned earlier that some rod makers prefer some sort of lathe bed to keep the lathe components easily aligned. If you make the base of each ballbearing rod-lathe support square with the corners just slightly rounded, an alignment bed is easily made. Parallel wood rails can be screwed to the workbench. The distance between the rails is such that the lathe-support bases will fit, and slide, between them. The rails can have straight sides, or they can be notched along the bottom. The dimensions of the notch are made to fit the thickness of the lathe-support bases. The lathe supports are then slid into the open end of the rails and moved to any desired position.

It is a good idea to mount your lathe power souce on a square sheet of plywood. A sheet 3/4 inch thick is ideal. Any screws or bolts that must be inserted all the way through the board can be inserted from the bottom through countersunk holes, keeping the bottom smooth and flat. To keep this base board from sliding in use, the entire underside, or portions along the sides, can be covered with a nonslip cushioned rubber with adhesive backing. When mounting the power source make sure the driveshaft is aligned at 90° to one side. Then the base board can be placed against the bed rails for perfect alignment.

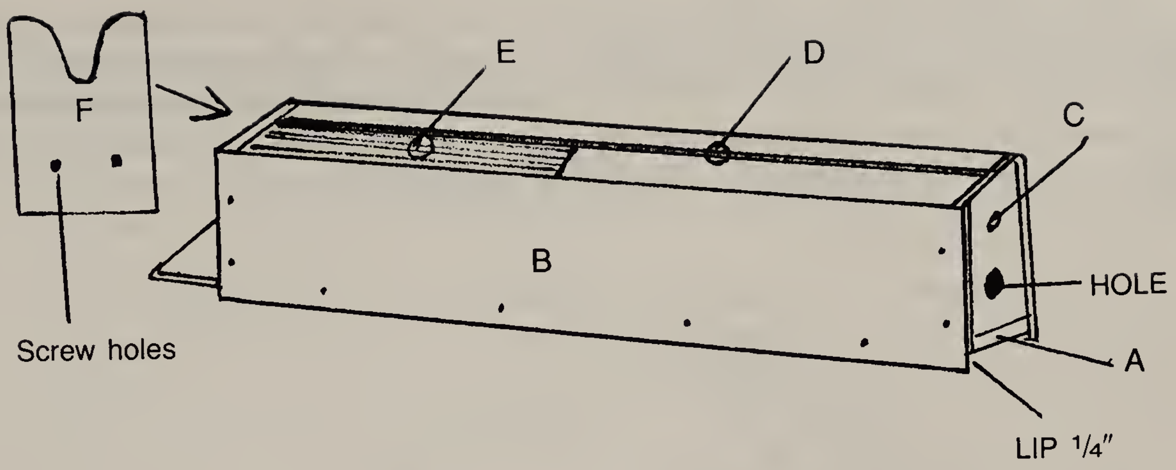


Rod lathe of electric drill, Crusenberry mandrel, and ball-bearing lathe support.

VACUUM BOX

If you have a rod lathe or a power shaping tool, you have the problem of keeping the dust from cork or resilient grips from floating freely in your shop. While we use a vacuum cleaner, getting it set up often takes too much time. RodCrafter Glen E. Fahlgren solved the problem by building a sturdy box that sits under the revolving handle and to which he could easily attach the nozzle of his vacuum cleaner. The box is 16 inches long to fit freshwater rods. In order to concentrate the air flow or vacuum at either end of the box, he made a sliding top. When a shift is made from shaping a foregrip to a butt grip, the top is slid to open the area directly beneath the grip being shaped.

The open part of the box is about nine inches long by 2¾ inches wide. The most important dimension is the height of the box. It must be high enough to be in close



Vacuum box fits under the grips being shaped on a lathe, drawing away dust and particles.

proximity to the turning grip, but not so close that it's in the way. The dimensions here fit our rod lathe but can be easily adjusted to a different arrangement.

Made of white pine, the floor of the box (A) is 2⁷/₈ inches by 19 inches. This fits over the aluminum lathe bed, allowing the box to be slid along the bed the same as the other lathe components. Since it will always be used at the butt end of the rod, the floor is three inches longer than the rest of the box. This extension acts as a bumper that fits against the lathe's head stock, preventing the box from coming too close to the lathe chuck. The two side pieces (B), 4¹/₄ inches by 16 inches, are screwed to the floor of the box so they extend ¹/₄ inch below the bottom. This ¹/₄-inch lip fits over the lathe bed and keeps the box aligned.

The two end pieces (C) are 2⁷/₈ inches wide by 3¹/₄ inches high. The vacuum-cleaner hose is attached to the hole at the tip end. The sliding top (E) is used to close off about half of the box. A piece 2³/₄ inches by 7 inches slides back and forth on two 14³/₈-inch lengths of ¹/₄-inch round (D).

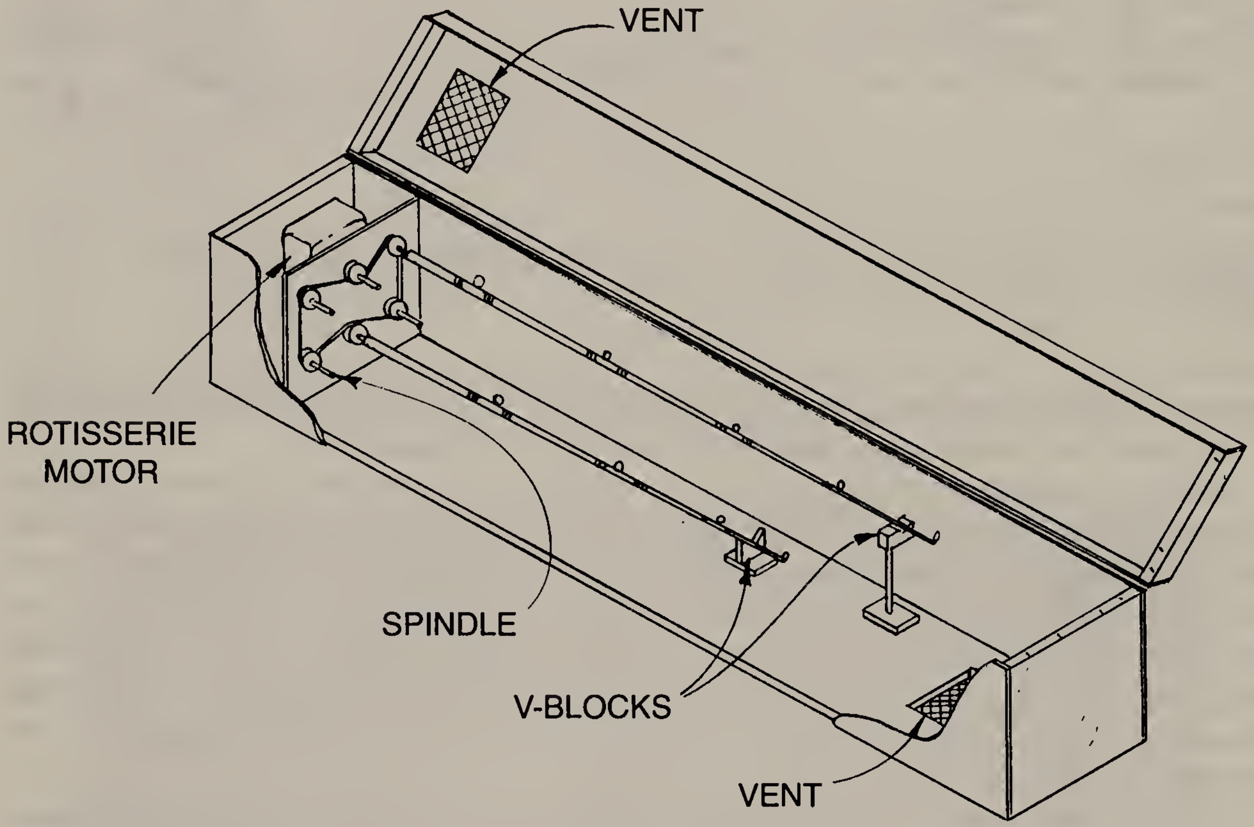
The safety shield (F) is made of ¹/₈-inch plexiglass, 4¹/₂ inches by 5¹/₂ inches and cut to shape as shown. It is predrilled for two small screws so it can be mounted with the notched end projecting above the top of the box. It protects one's knuckles from accidentally contacting the revolving lathe chuck. It should be mounted high enough so the shaft of an Internal Expansion Vise (or whatever you use to hold the blank in the chuck) is inside the notch).

Glen suggests sanding the box smooth and finishing it to eliminate even the tiniest crevices in which dust can lodge. He sets his Butt-Wrap Alignment Tool on top of the box. He then uses the lathe's 90° indexing head to more quickly mark the rod's four axes and the wrap's centers. In this way, all markings can usually be done with the rod mounted in the chuck and after the guides are wrapped in place.

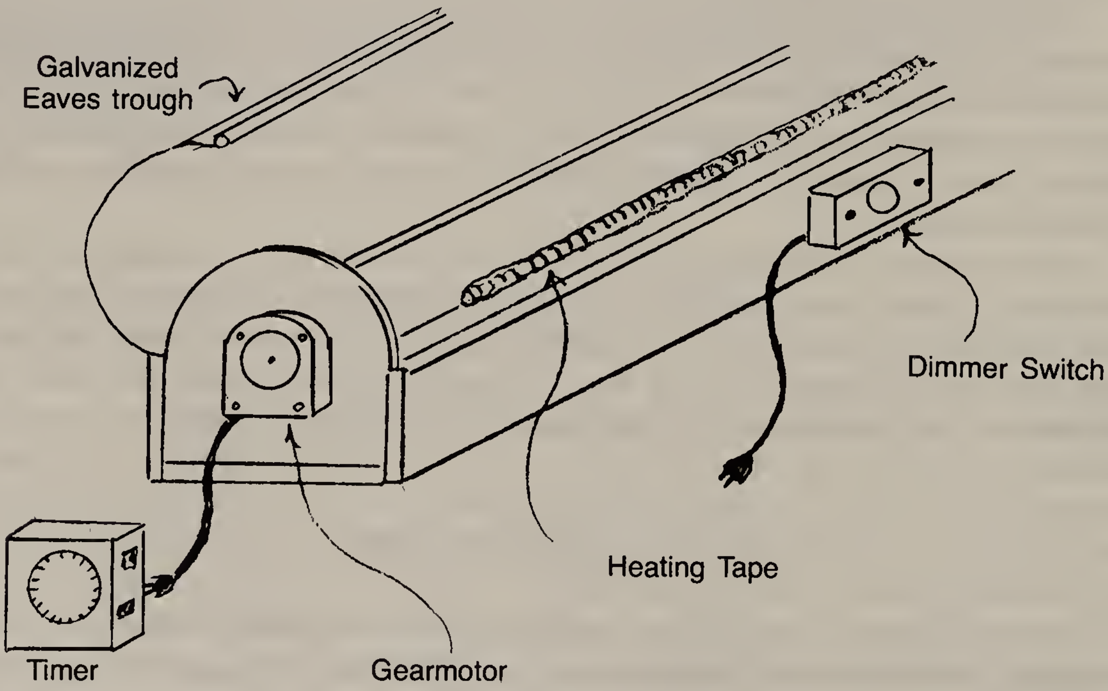
DRYING BOX

A drying box is an excellent solution to the dust problem most of us have with our wrapping finishes. It also provides a way to control the temperature in the immediate area surrounding the rod for a better cure of the finish. The box is made long enough to hold the longest one-piece rod or rod section that you anticipate building. The inside dimensions can be big enough for just one rod or a number of rods.

Two drawings show different units. The one with the rounded top of galvanized eaves was made by RodCrafter Jim Corbin. It contains a four-foot heating tape available from laboratory-supply houses. The tape is suspended from screw eyes and attached to a 600-watt dimmer switch mounted in a standard receptacle box on the front of the unit. He uses it to keep the temperature in the 80° to 90° range.



Drying Box.



Corbin's Covered Cooker.

For rod rotation, he uses a low-rpm gearmotor mounted on the outside of one end panel. The motor shaft extends inside for connection to the rod with masking tape. Because of the domed lid, the sides of the box are low enough to allow the finish to be applied with the rod in place.

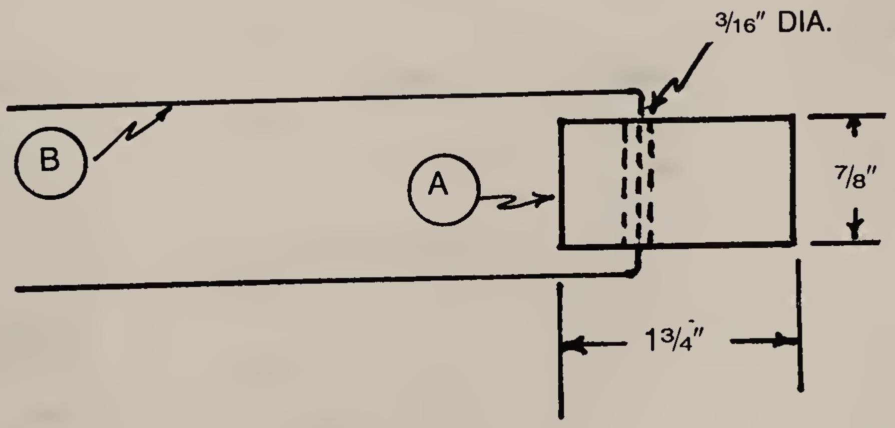
The other drawing shows a box that will hold up to six rods or rod sections. It was made by RodCrafter Bill Cymbal. He incorporated two vents, each covered with nylon fabric, for dust-free ventilation. A rotisserie motor is mounted at one end of the box and it drives the upper center spindle through a 1/8-inch piece of masonite. This spindle, with the aid of a flat rubber band, drives the remaining five spindles. Bearings have been mounted to the masonite board and the spindles are held in place with set screws. The small ends of the spindles are covered with pieces of foam which allow the hollow end of the blank to be slipped in place for a positive drive while rotating. Some blanks which do not have a hollow end can be held in place with masking tape. The opposite end of the blank is supported in V-blocks matching the height of the spindle being used.

Both of these rod builders connect the motor to a timer so the box can be left unattended while they do other work or leave the shop. Before each use, the interior of the boxes is vacuumed. Another source of heat can be a string of outdoor Christmas tree lights. These have larger bulbs than the indoor type. Or you can build in lamp sockets for two low-wattage bulbs. Some RodCrafters have lined their boxes with aluminum foil to reflect and distribute the heat. However you make it, a drying box can contribute greatly to a crystal-clear finish.

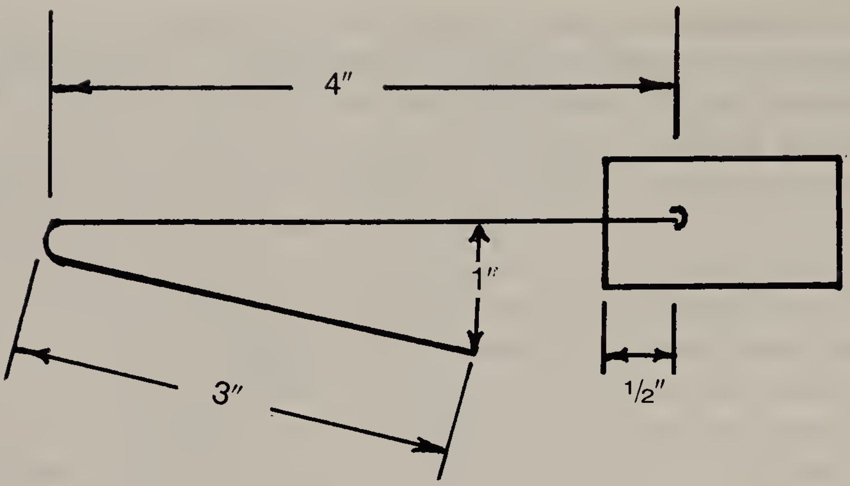
OFFSET HANDLE TURNER

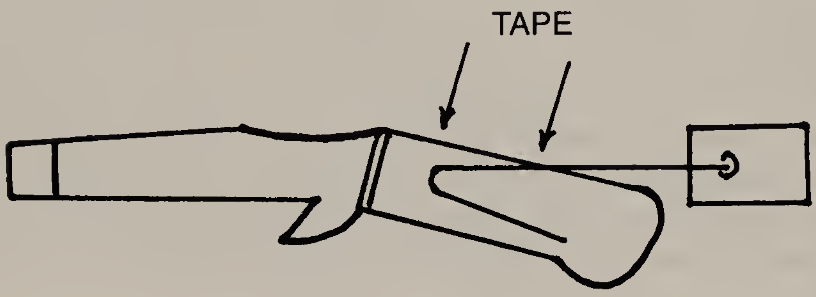
Refinishing a baitcasting rod with a glued-on pistol grip or finishing a new rod with one of the various glued-on offset handles can present some difficulties. The offset causes the rod to turn off center, and the handle presents an odd shape with too big a cross section for the turning motor chuck. Using a wire coat hanger and a piece of dowel, RodCrafter J.M. Rogers has made a fixture that permits attachment of the handle to the chuck for smooth turning.

Refer to the sketch as a guide and cut a piece of 7/8-inch dowel (A) 1 3/4 inches long. Drill a 3/16-inch hole about 1/2 inch from the end. Cut a piece of coat hanger (B) 15 inches long, center it in the dowel hole, and bend both ends parallel. At a point four inches from the hole, bend the ends of each wire back toward the dowel so they are three inches long and the ends are one inch from the four-inch leg.



Offset Handle Turner for casting rods with glue-in handles. *(continued on next page)*





To use the fixture, place the arms along each side of the grip as shown so that the centerline of the dowel is in line with the centerline of the rod blank. Attach the fixture with duct tape, center the dowel in the turning motor chuck, and the rod will rotate true.

SIZE CONVERSION CHART

Fiberglass Rod Making contained a size conversion chart, but the following is more complete and includes the metric scale. My thanks to RodCrafter Joy Dunlap, who made the chart.

SIZE CONVERSION CHART

64th Inch Tackle Size	*Metric*	*Fraction*	*Decimal*
	0.42		
	mm	1/64″	.0156″
	0.50		.0312
		1/32″	.0312
	0.80		.0315
	1.00		.03937
3		3/64″	.0468
3½		7/128″	.0546
4		1/16″ (4/64)	.0625
4½		9/128″	.0703

SIZE CONVERSION CHART (cont.)

64th Inch Tackle Size	*Metric*	*Fraction*	*Decimal*
5	7	5/64″	.0781
	2.0		.07874
5½		11/128″	.0859
6		3/32″ (6/64)	.0937
6½		13/128″	.1015
7		7/64″	.1093
7½		15/128″	.1171
	3		.11811
8		1/8″ (8/64)	.125
9		9/64″	.1406
10		5/32″ (10/64)	.1562
	4		.15748
11		11/64″	.1718
12		3/16″ (12/64)	.1875
	5		.19685
13		13/64″	.2031
14		7/32″ (14/64)	.2187
15		15/64″	.2343
	6		.23622
16		1/4″ (16/64)	.25
17		17/64″	.2656
	7		.27559
18		9/32″ (18/64)	.2812
19		19/64″	.2968
20		5/16″ (20/64)	.3125
21	8	21/64″	.3261
22		11/32″ (22/64)	.3437
	9		.35433
23		23/64″	.3593
24		3/8″ (24/64)	.375
25	10.0	25/64″	.3906
26	10.5	13/32″ (26/64)	.4062
27	11.0	27/64″	.4218
28		7/16″ (28/64)	.4375
29	11.5	29/64″	.4531
30	12.0	15/32″ (30/64)	.4687
31		31/64″	.4843
	12.5	63/128″	
32		1/2″ (32/64)	.5
	13.0		
33		33/64″	.5156

SIZE CONVERSION CHART

64th Inch Tackle Size	*Metric*	*Fraction*	*Decimal*
34	13.5 mm	17/32″ (34/64)	.5312
35		35/64″	.5468
	14.0 mm		

SIZE CONVERSION CHART (cont.)

64th Inch Tackle Size	*Metric*	*Fraction*	*Decimal*
36		9/16″ (36/64)	.5625
37		37/64″	.5781
	14.5 mm		
38		19/32″ (38/64)	.5937
	15.0		
39		39/64″	.6093
40		5/8″ (40/64)	.625
41	16.0	41/64″	.6406
42		21/32″ (42/64)	.6562
43		43/64″	.6718
44		11/16″ (44/64)	.6875
45		45/64″	.7031
46		23/32″ (46/64)	.7187
	18.0		
47		47/64″	.7343
48		3/4″ (48/64)	.75
49		49/64″	.7656
50		25/32″ (50/64)	.7812
51	20.0	51/64″	.7968
52		13/16″ (52/64)	.8125
53		53/64″	.8281
54		27/32″ (54/64)	.8437
55		55/65″	.8593
56		7/8″ (56/64)	.875
57		57/64″	.8906
58		29/32″ (58/64)	.9062
59		59/64″	.9218
60		15/16″ (60/64)	.9375
61	24.0	61/64″	.9531
62		31/32″ (62/64)	.9685
63		63/64″	.9843
64	25.7	1″	1.00
		1-3/16″	
	30.0		1.1811
		1-17/64″	
	32.0		1.25984
		1-27/64″	
	36.0		1.41732
		1-37/64″	
	40.0		1.5748
		1-57/64″	
	48.0		1.88976
		1-63/64″	
	50.0		1.9685
		2-24/64″	
	60.0		2.3622

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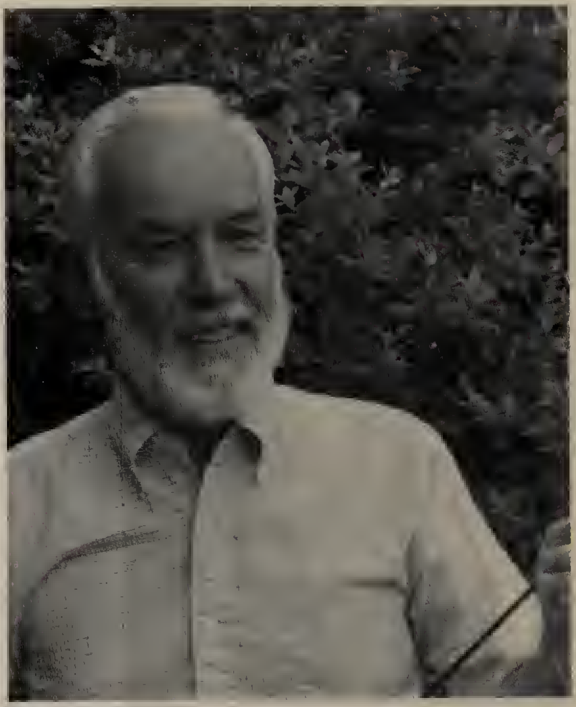

Dale P. Clemens is a former insurance executive who now is completely immersed in his greatest love, custom rod building. He owns Dale Clemens Custom Tackle (the largest mail-order rod building supply business in existence) and is Editor and Publisher of the RodCrafters Journal. He holds two-day seminars all over the country and also lectures nationwide on custom rod building. He is a consultant to various rod manufacturers, and his articles have appeared in numerous publications. An ardent fly and light tackle angler, he fishes worldwide, especially in Central America. He and his wife, Donna, live in Allentown, Pennsylvania.

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WINCHESTER PRESS
An Imprint of *NEW WIN PUBLISHING, INC.*

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ISBN 0-8329-0436-8